HEATING AND VENTILATING

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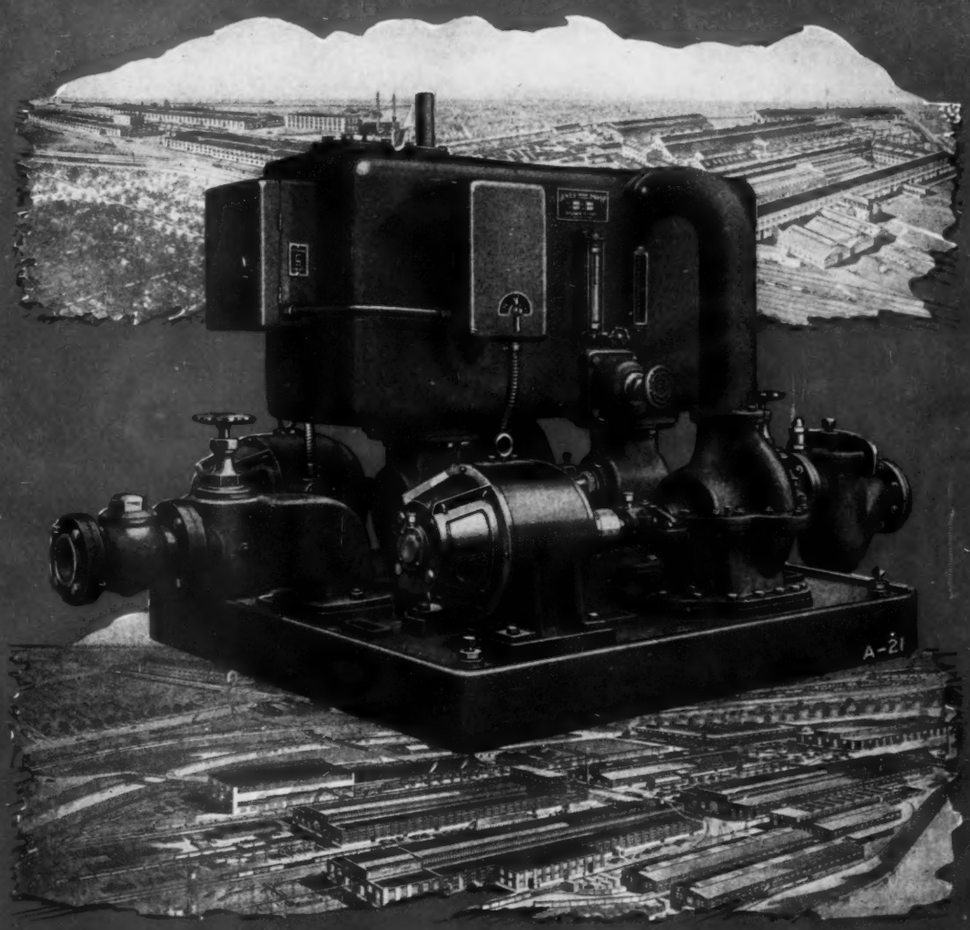
OCTOBER 1929



The AMES PUMP is the product of two organizations—Ames Pump Company, Inc. and American Locomotive Company.

Because of this affiliation, all the resources of the parent company, with its huge shops and facilities for painstaking and thorough research, are reflected in the locomotive precision and dependability built into every AMES PUMP.

AMES PUMP COMPANY, INC.

30 Church Street - New York City

Affiliated with **AMERICAN LOCOMOTIVE COMPANY**

Quicker, CLEANER HEATING

—and at less cost with this Modern Radiator

The modern McQuay is *more* than an attractive radiator. It dispenses healthier, moistened heat quicker, with a decided fuel saving.

The tube and copper fin heating unit is the most efficient medium known for transferring heat. And the heated air is sent out **in a horizontal direction** with sufficient initial velocity to circulate it completely—heating rooms far more quickly and preventing soiling of walls and drapes.

Due to this complete circulation, and the greater heating effectiveness of moist air, rooms are kept comfortably warm with lower radiator temperatures—**materially reducing heating costs.**

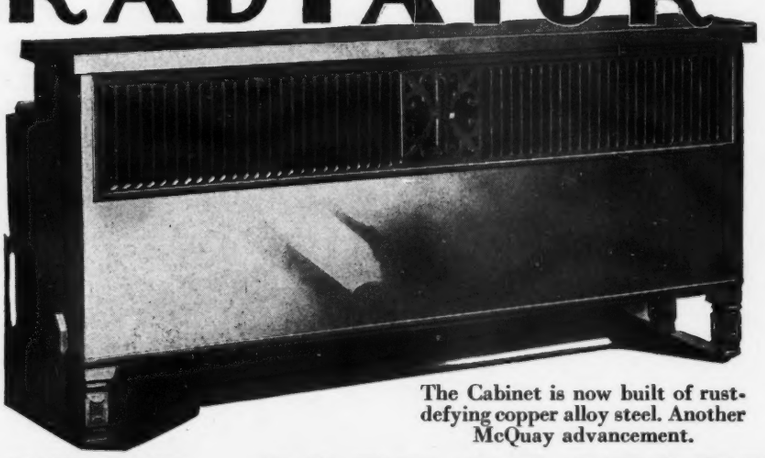
Honestly Rated

McQuay radiators are accurately rated. They will heat every bit of the capacity guaranteed by their catalog ratings.

Weigh Less—Occupy Less Space

A 50 square foot McQuay weighs about 75 pounds. You can tuck it under your arm. That cuts freight, handling and installation costs.

McQUAY Cabinet RADIATOR



The Cabinet is now built of rust-defying copper alloy steel. Another McQuay advancement.

McQUAY RADIATOR CORPORATION

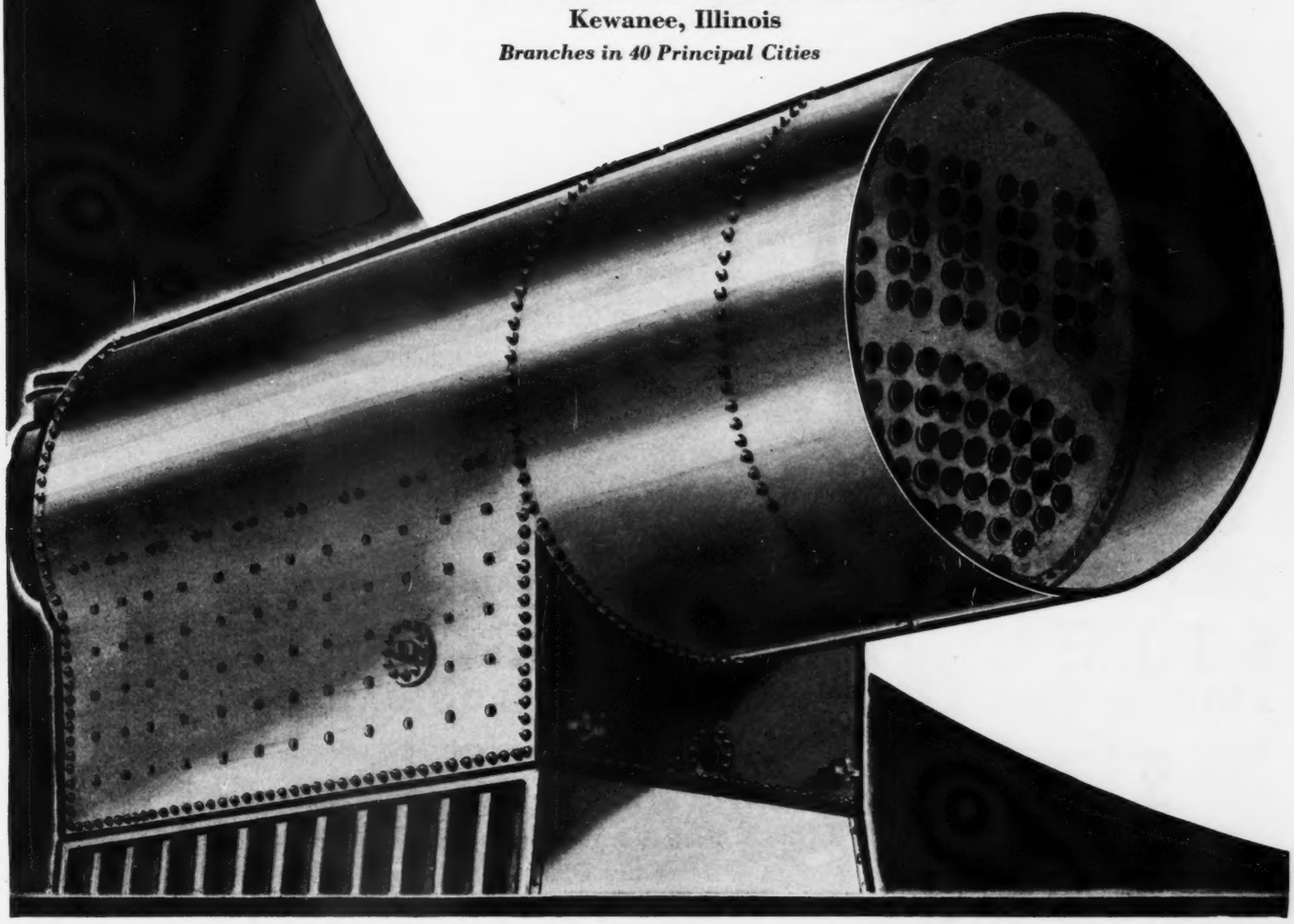
General Offices, 35 East Wacker Drive, Chicago ***Branches in most principal cities***

KEWANEE

STEEL RIVETED BOILERS

Look at a Kewanee from any angle and its greater strength and dependability is quickly apparent. We could *build and sell them for less.* But to do so we would have to leave out some of that extra strength, dependability and efficiency which makes Kewanee today's best boiler investment.

KEWANEE BOILER CORPORATION
division of
American Radiator and Standard Sanitary Corporation
Kewanee, Illinois
Branches in 40 Principal Cities



HEATING AND VENTILATING, *formerly* THE HEATING AND VENTILATING MAGAZINE, published by NATIONAL BUILDING PUBLICATIONS, Division of NATIONAL TRADE JOURNALS, INC., at 521 Fifth Ave., New York, N. Y. Subscription rates: United States, $2.00; Canada, $2.50; Foreign, $3.00. Single copies, 30 cents. Vol. XXVI, No. 10, October, 1929. Entered as second-class matter, April 18, 1925, at the Post-Office at New York, N. Y., under the Act of March 3, 1879. Copyright, 1929, by NATIONAL TRADE JOURNALS, INC.

A GREEK CHORUS

of Satisfied Buyers

When Greek playwrights wanted an audience to know about a character in a play, they let the chorus discuss him.

Much the same method is used by Bridges and Graves, highly successful Realtor-Builders of Indianapolis. Telling in the National Real Estate Journal how to profit from building and selling houses, Mr. W. L. Bridges says:

"It has been our policy to go beyond the building code in our homes. We have found this good practice, for we have secured much of our business from the recommendation of satisfied buyers to relatives and friends."

In listing the better-than-average materials that have gone into these homes, he, of course, includes *Pacific Steel Heating Boilers.*

Undoubtedly, such materials as Pacific Steel Heating Boilers not only help to sell houses but to swell the Greek chorus of a Realtor's satisfied buyers. As for an architect, they swell the chorus of satisfied clients; for a building manager, the chorus of satisfied tenants; for a contractor, the chorus of satisfied customers; for a school board, the chorus of satisfied parents.

PACIFIC

STEEL HEATING BOILERS

AND CAPITOL RADIATORS MAKE A LOGICAL COMBINATION

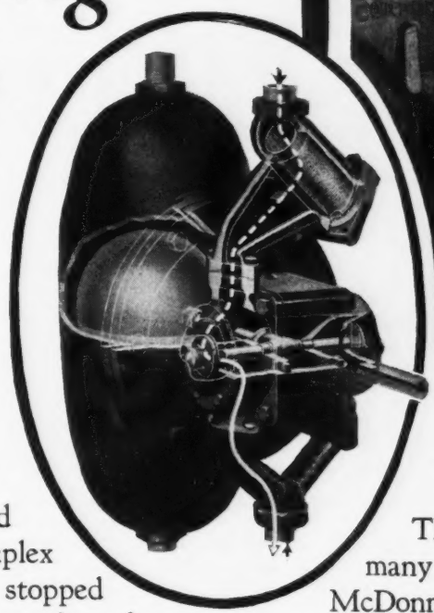
PACIFIC STEEL BOILER CORPORATION

Factories: Waukegan, Ill., Bristol, Pa.

Sales Offices in 58 Cities

Division of United States Radiator Corporation, Detroit

There are times when only a *self-cleaning* feeder is *safe*



YOU probably realize that no heating boiler is properly protected until it is equipped with a duplex feeder. But have you ever stopped to consider the fact that a number of conditions are met by only *one* feeder?

Where feed water is particularly hard, for instance, it is doubtful whether any feeder can cope with this condition except the feeder with "the valves that stay new"—the feeder with the rotary, self-grinding valves. And it is certain that if the current to the condensation pump fails, only the feeder with capacity enough to supply the requirements of *any* heating boiler is *entirely safe*.

These are only two of the many outstanding features of the McDonnell & Miller Self-Cleaning Duplex Feeder, but they are characteristic of the refinements that place it in a class of its own—refinements like adjustable water level and adjustment in differential between valve openings.

When you install or specify such a feeder you *play safe*. Also remember that our unconditional guaranty for a full year shifts the responsibility from you to *us*.

Where shall we send our booklet covering capacity curves and similar data? Tell us on the coupon below.

Also made with single valve

Feeders built to the same high standard that is found in M. & M. Duplex Feeders are made with a single valve of the rotary, self-cleaning type. Ask for special bulletin covering this feeder.

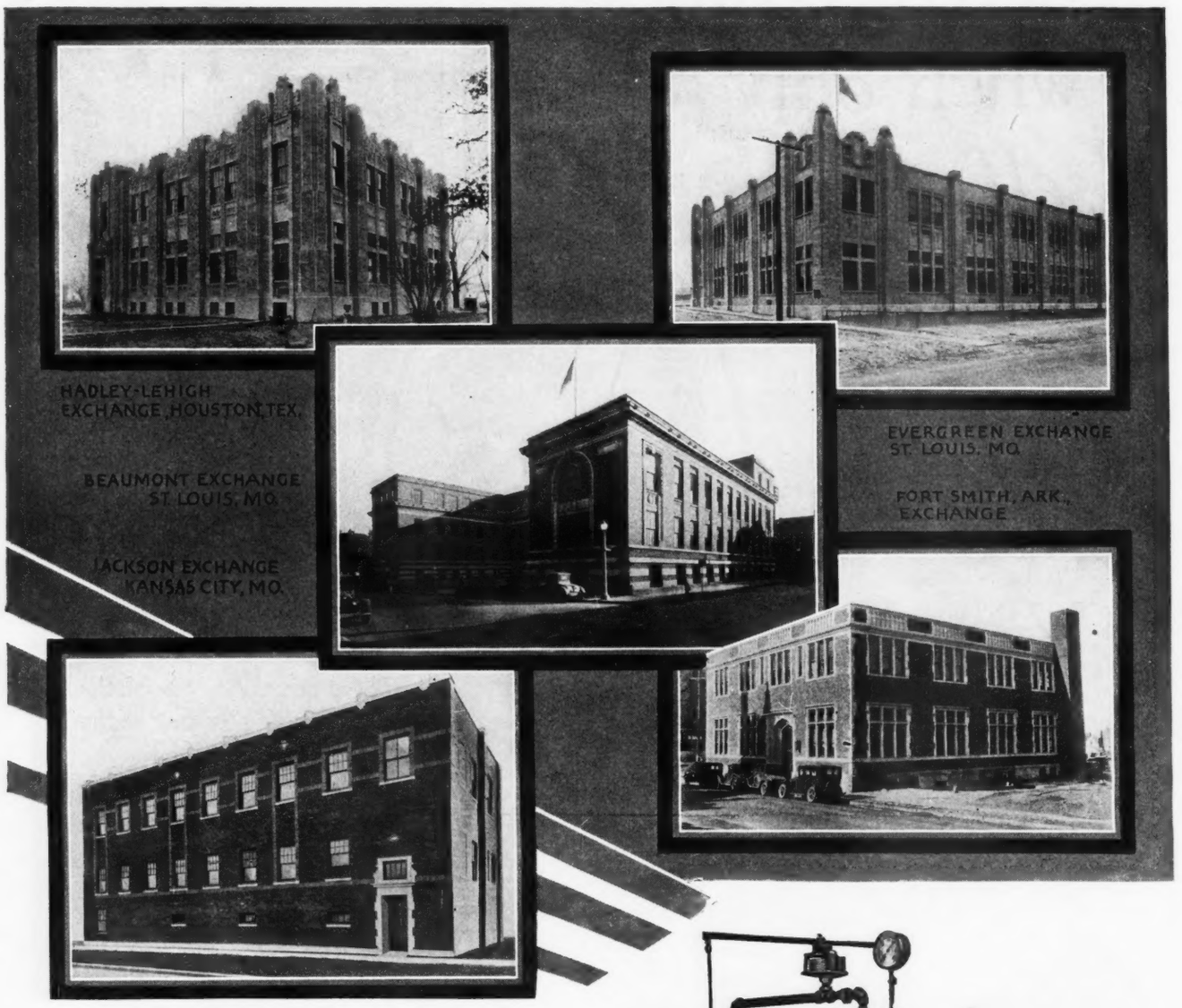
W & K-7407

McDONNELL & MILLER
1314 Wrigley Bldg., Chicago

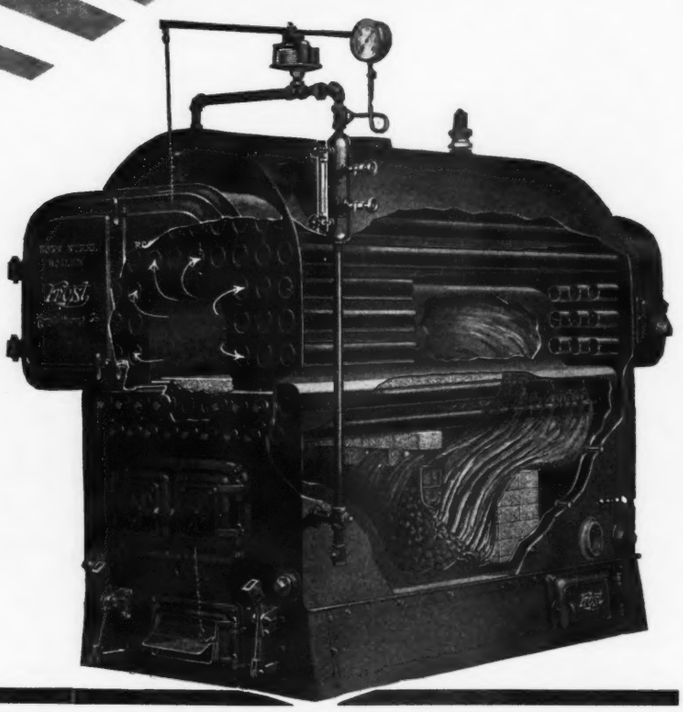
McDONNELL & MILLER
SELF-CLEANING
Duplex Feeder
"Doing one thing well"

McDonnell & Miller,
1114 Wrigley Bldg., Chicago
Please send a copy of your 8-page booklet to:
Firm
Name
Street & Number
City & State
H V-10

ROSS STEEL BOILERS


HADLEY-LEHIGH EXCHANGE, HOUSTON, TEX.
BEAUMONT EXCHANGE ST. LOUIS, MO.
JACKSON EXCHANGE KANSAS CITY, MO.
EVERGREEN EXCHANGE ST. LOUIS, MO.
FORT SMITH, ARK., EXCHANGE

The new exchanges of the Southwestern Bell Telephone Co. are installing Ross Steel Heating Boilers.



The Frost Manufacturing Co.
SINCE 1851
Galesburg, Illinois
Branches in most leading cities.

COIL FOR OIL BURNING

STEEL HEATING BOILERS AND WATER HEATERS

IT is the amount of heating surface, provided it is properly placed in relation to the fire, that determines the amount of oil used to heat your building. The amount of heating surface per unit of rating in the Coil Boiler is exceptionally high and it is tremendously effective because it is "within view" of the flame, hence, capable of absorbing the radiant heat. Take this fact into consideration when specifying boilers to fill your customers' wants. Your own investigation will decide you on Coil Boilers every time.

If desired, Coil Oil Burning Boilers can be fitted with grates, shaking apparatus, etc., in thirty minutes' time.

We will send you our complete catalog upon request.

MONITOR BOILER COMPANY

1505 Race Street :: :: Philadelphia, Pa.

The

Only the Thermal Unit has all of these features:

1 A one-piece aluminum heating section individually tested and regularly listed for steam pressures up to 250 pounds.

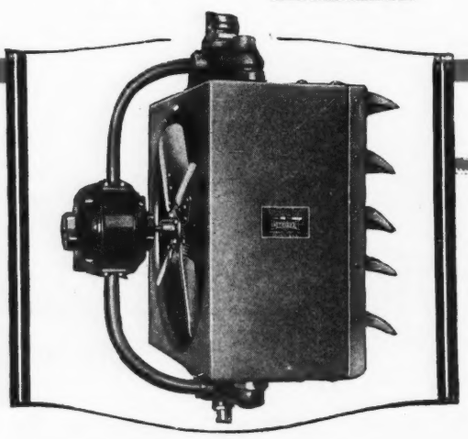
2 A heating section that is totally free from joints or connections. Leakage or losses in heat transmission are *impossible*.

3 Airplane design in air passages, fins, and louvers means minimum resistance to air delivery and greater projection of heat.

4 Heating section is so ductile that it cannot even be damaged by freezing while in service.

5 Liberally rated motor is suspended so that vibration is minimized. As a result, Thermal Units are quiet in operation.

6 Thermal Units are backed by an engineering service that invariably "makes the layout justify the outlay." They are specifically guaranteed by a highly responsible manufacturer.



The completely assembled Thermal Unit is shown above. Also note the enlarged view of the heating section opposite. It is this cast aluminum alloy section that is behind the efficiency and stamina of the Thermal Unit.

WGK-7417

unit heater that set its own standards

Is it possible to obtain Thermal Unit service without using Thermal Unit construction?

Many authoritative heating engineers answer "No," to this question. With ever-increasing frequency they are specifying Thermal Units because they realize that its long-lived one-piece heating section sets it distinctly apart from all other unit heaters.

Until the Thermal Unit was developed, delicate heating sections with soldered or welded connections were taken for granted. But the Thermal Unit has set its *own* standards—standards that have revolutionized unit heater construction.

The result is a one-piece heating section in which the transmission of heat is unbroken from the steam column itself to the very tips of the fins—a heating section with airplane design of both fins and column which means far greater projection of heated air than is possible with ordinary unit heaters.

So ductile is the aluminum alloy from which this heating section is made that even freezing in service will not damage it. The stamina of this alloy is attested by the fact that Thermal Units are regularly furnished to operate on steam pressures up to 250 pounds.

—And never forget that the service-life and efficiency of a unit heater rests almost entirely on the heating section!

Ask for complete description of the unit heater that "outlasts them all."

THERMAL UNITS CO.

A Subsidiary of the Mechanical Mfg. Co.

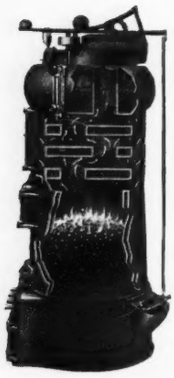
Pershing Road and Loomis Street, Chicago, Ill.

Eastern Office: 30 Church Street, New York, N. Y.

THERMAL UNIT
INTEGRAL SECTION
HEATERS
PATENT PENDING

Approved by Investigating Committees of Architects and Engineers

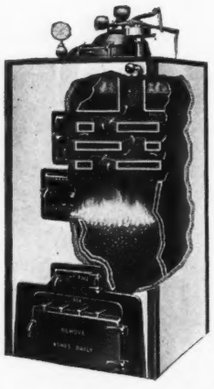
Specify Page Boilers



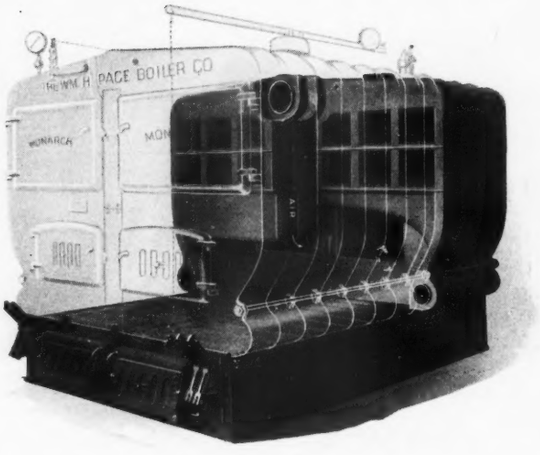
Volunteer Boiler, for the utmost in home comfort

MORE grate, more heating surface, proportioned for high efficiency and fuel economy—all good reasons why Page need not rely on extravagant claims, but can point to an enviable record (since 1856) of heating satisfaction under most difficult conditions, and in about every type of structure.

Page Boilers are built in round and square sectional form, from the 11″ Volunteer to the 60″ Monarch twin-section boiler, for the largest of jobs. They will fit almost any job, and satisfy your most critical client.



Red Diamond Jacketed Boiler, in red and black, to brighten up the cellar



Monarch 60″ Twin Section Boiler, for the big jobs. Same efficient construction in smaller sizes.

Write us for your copy of our 1929 catalogue and prices

The Wm H Page Boiler Co

Branch Offices and Warehouses:
Boston, 123 Beverly Street
Philadelphia, 1126 Washington Ave.
Cleveland, Rose Building
Factory: Meadville, Penna.

General Offices: 200 Madison Avenue, New York City

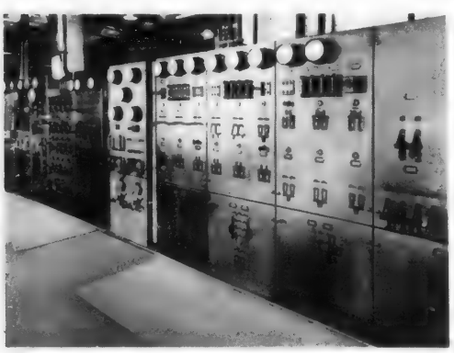
To rate a heating pump by radiation surface alone ◀◀◀

is to risk the entanglements and snarls of inadequate pump capacity

Tested Air and Water Capacity

is the only safe basis on which to predetermine pump performance

IN RATING a vacuum heating pump it cannot be assumed that every heating system containing the same square footage of radiation presents the same pumping problem. Varying conditions must be taken into account. One system may be widespread, another compact. On one it may be necessary to lift the condensate, on another it may not. Allowance must be made for air leaks which often develop after a system has been in service.



REMARKABLE SWITCHBOARD IN NASH TEST PLANT FURNISHES ELECTRIC CURRENT OF ANY VOLTAGE, PHASE AND FREQUENCY

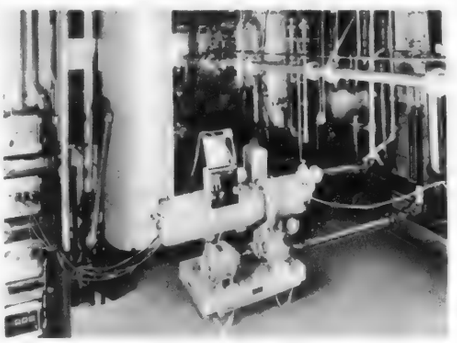
For this reason, a pump should only be rated as suitable for a given amount of radiation if its combined air and water capacity is known to be sufficient to handle this amount of radiation under every condition.

Jennings Vacuum Heating Pump ratings in square feet of equivalent direct radiation are supported by guaranteed air and water capacity *determined by actual test.*

CAPACITIES OF JENNINGS VACUUM HEATING PUMPS

Pump Size	Equivalent Direct Radiation Square Feet	Water Capacity G.P.M.	Air Capacity Cu. Ft. Per Min.	Orifice Diameter Inches	MOTOR HORSEPOWER			
					10 Lbs.	20 Lbs.	30 Lbs.	40 Lbs.
T	2,500	4	3	7/64	1/3	1/2	1	1 1/2
U	5,000	9	3	7/64	1/3	1/2	1	1 1/2
V	10,000	14	6	5/32	1	1	1 1/2	2
B	16,000	22	9	3/16	1 1/2	2	3	5
C	26,000	35	15	1/4	2	3	5	5
D	40,000	60	19	9/32	3	5	5	7 1/2
E	65,000	90	34	3/8	5	5	7 1/2	10
F	100,000	140	50	7/16	7 1/2	10	15	15
*G	150,000	200	102	5/8 & 5/16	10	15	UPON REQUEST	
*H	300,000	400	171	2-7/16 & 1-5/8		UPON REQUEST		

* *The last two sizes are not of the manifold type.*



JENNINGS VACUUM HEATING PUMP ON TEST STAND

The figures in the table have been established by Nash engineers after thirteen years of experience and research. The air and water capacities shown are those that a pump must remove *simultaneously* from a heating system of a given size to insure the satisfactory operation of that system throughout its life.

Tested Capacities Support Jennings Ratings

To substantiate Jennings Vacuum Heating Pump ratings, every Jennings Pump is tested at the factory before shipment. Working conditions are reproduced by special testing apparatus. Electric current of any phase, voltage and frequency is made available by a switchboard designed for the purpose. Air and water capacities are accurately determined. Horsepower consumed is measured. Each pump is tested with its own motor and control equipment. Jennings Pumps are made to demonstrate that they will work properly on the job.

A certified report of the results is furnished to the purchaser. The prospective user, his engineer, or any other person designated, may witness the test.

Water capacity is determined by measuring the volume of water in g.p.m. that the pump removes from the receiving tank under the given vacuum and delivers against the specified discharge pressure. Water capacity is measured *at the same time* that the pump is delivering its maximum rated quantity of air.

Air Capacity is Measured by Calibrated Orifice

STANDARD TEST ORIFICE

This orifice is of specified diameter, reamed in a brass plate one-eighth inch thick, located in the pump suction and communicating with the receiving tank. It measures the cubic feet per minute that the pump withdraws from the receiving tank and discharges to the atmosphere. Air capacity is determined *at the same time* that the pump is delivering its maximum rated volume of water.

CERTIFIED REPORT OF TEST

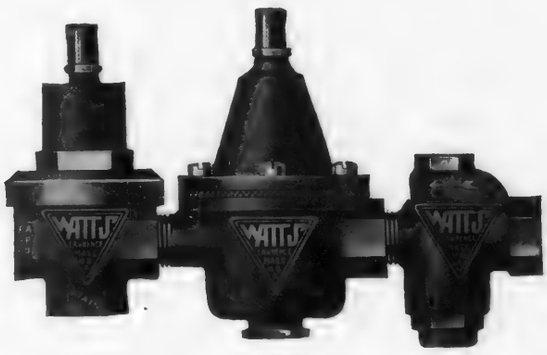
Compare vacuum heating pumps by combined water and air capacity and by horsepower. Call for a certified test report, to be substantiated, if possible, by a second test on the job. Ask for a calibrated orifice and make your own comparative tests.

Jennings Pumps

NASH ENGINEERING CO.
SOUTH NORWALK CONN., U. S. A.

WATTS UNIT

Hot Water House Heating



APPROVED!

The Relief Valve is approved by the Underwriters' Laboratories and by the National Board of Boiler and Pressure Vessel Inspectors as ASME Standard, and by three of the largest manufacturers of automatic water heaters in the United States. The Reducing Valve has been approved by the many users throughout the country during its sixteen years on the market, and the entire Unit has been heartily approved by Contractors on its many thousands of installations.

Your nearest representative listed below will be glad to call on you and fully explain our product. We have a new complete discount sheet which we will be glad to send to you on request.

Sales Associates:

JOHN G. KELLY, INCORPORATED

210 East 45th Street **New York City**

JOHNNIE MOORE,
1020 Lawrence Ave.,
New Lawrence Hotel,
Chicago, Ill.

GEORGE E. KITSON CO.,
5939 Haverford Avenue,
Philadelphia, Pa.

M. M. RIVARD SALES CO.,
601 Gumbel Building,
Kansas City, Mo.

FRED S. WILSEY,
717 Plymouth Building,
Minneapolis, Minn.

J. B. JAMES,
1220 Irwin Ave., N. S.,
Pittsburgh, Pa.

ERNEST SANGER,
1045 Wayburn Avenue,
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GEORGE A. SUITS,
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HOOVER BROS. CO.,
601 State Life Bldg.,
Indianapolis, Ind.

Wm. H. WIX,
801 Hampson Street,
Baltimore, Md.

In Canada:
CUNNINGHAM & HILL, LTD.,
271 West Richmond St., Toronto, Ontario.

Watts Regulator Company
Lawrence Mass. Est. 1874

AN OUTSTANDING CONTRIBUTION to GAS HEATING

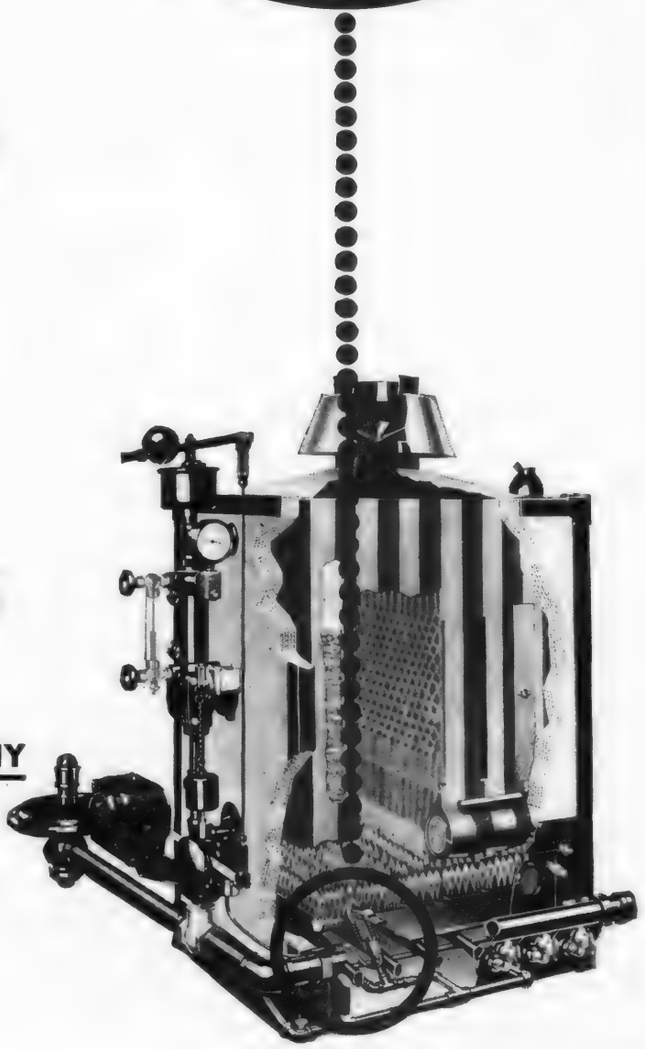
• THIRD •

VAPOR-TENSION THERMOSTATIC PILOT

OPERATES ON PRESSURE CAUSED BY VAPORIZING A VERY VOLATILE LIQUID. AFTER INITIAL SETTING NO FURTHER ADJUSTMENT REQUIRED . . . .

FOUND ONLY ON

IDEAL GAS BOILERS



MADE BY

AMERICAN RADIATOR COMPANY

SOLD BY

AMERICAN GAS PRODUCTS CORPORATION

376 LAFAYETTE STREET . . NEW YORK

NEW Dole VACUUM VALVE No. 2 B

NEW CHROMIUM PLATED FINISH

NEW CONSTRUCTION

New Application of Principles

Not just a new vacuum valve but an entirely new application of principles—the new Dole Vacuum Valve (No. 2-B). It differs from ordinary vacuum valves in that it seals the steam through the combined action of a vacuum primer, a bellows and a thermostatic float.

In actual test and use, this new Vacuum Valve has shown remarkable results. Radiators stay hot many hours after the fire is banked. Definitely holds a vacuum. Permits new steam to enter quickly and without resistance, even at low temperatures. Amazing performance—positive fuel saving—greater comfort.

Its good appearance suggests its splendid operation. A new and very attractive design, beautifully finished in the modern way—lustrous, highly-polished non-tarnishable chromium plating. Rich, different, distinctive. Completely harmonizes with any decorative scheme.

Nationally Advertised to Over 6,000,000 People

People who are tired of noisy—half-cold radiators will be told the story of the new Dole Vacuum Valve this Fall and Winter. Over 6,000,000 readers of The Saturday Evening Post, Literary Digest and American Magazine—owners of homes, apartments, etc., will read messages of greater comfort and economy—welcome news of a valve that helps maintain summer warmth—sealed comfort, all winter long.

This new valve, backed by a national advertising campaign, means profits for heating contractors who sell it. Many one-pipe steam heating systems in YOUR community are inefficient and wasteful—every one a prospect for the new Dole Vacuum Valves. Start now to campaign your territory for greater prestige and profits. Order six Dole Vacuum Valves (No. 2-B) today. Install them on a balky system and check results. If not completely satisfied, send the valves back—they're definitely guaranteed.

Write NOW for complete information.

Dependable Triple-Action

A vacuum primer, a bellows and a thermostatic float—this triple-action insures positive performance. It "holds a vacuum."

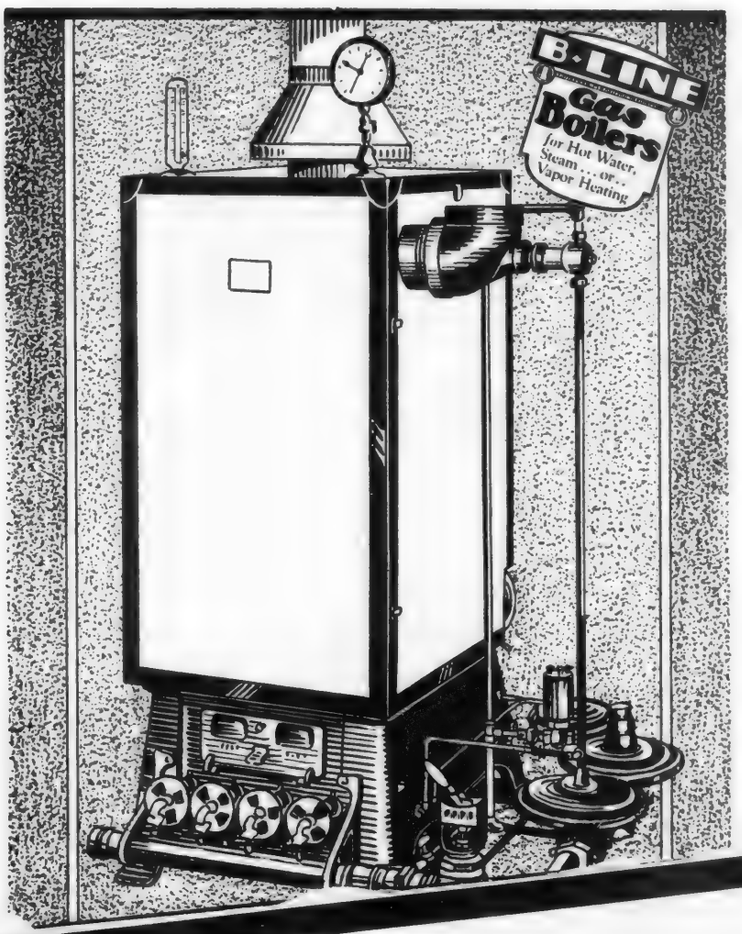
100 per cent automatic—non-adjustable, cannot leak water, foolproof, seat self-cleaning, syphon instantly drains away condensation, vacuum primer a sure starter, bellows design positively assures a vacuum. No "radiator static."

Made from best materials. Precision workmanship throughout. Fully tested, and guaranteed for 5 years. Valves individually packed in smart containers. Special display box holds 12.

Selling points galore!

THE DOLE VALVE COMPANY

1913-33 Carroll Avenue, CHICAGO



Every B-Line Job you put in sells another

B-Line's smashing success in the gas heating field is due chiefly to unfailing customer satisfaction.

Owners have been so pleased with an economy exceeding their best hopes that they have been our best advertisements and our best salesmen.

This customer enthusiasm is a tremendous advantage that goes with the B-Line franchise. In fact it is not too much to say that it has made B-Line the easiest selling gas boiler in the field.

Write today for the B-Line proposition.

Visit the B-Line Exhibit in Atlantic City at the A. G. A. Convention October 14 to 18.

B-LINE BOILER COMPANY

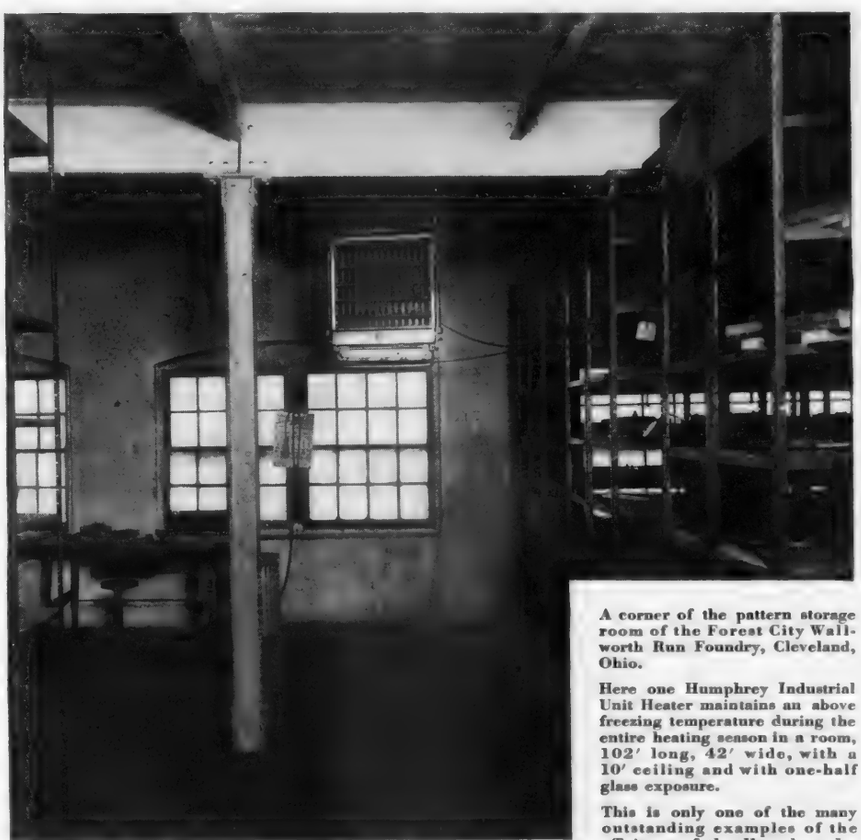
Cleveland, Ohio

The Humphrey *Industrial Unit Heater*

serves a two-fold purpose in modern industrial heating

Humphrey Industrial Unit Heaters are rapidly revolutionizing factory heating methods everywhere. Their use solves two prevailing heating problems. ¶ In many factories, a battery of them becomes the entire heating system, replacing furnaces, boilers, licensed firemen and the wastes of coal consumption, as well as eliminating all smoke, dust and ashes. A group of these compact gas burning units are suspended from the ceiling at regular intervals, and maintain an ideal temperature throughout the plant the year around. Their operation is under positive control. They may be instantly turned on when heat is needed, or turned off to avoid any overheated condition. ¶ In other factories, Humphrey Industrial Unit Heaters are used to supplement central heating plants and lighten the burden placed on overloaded furnaces, pipes and boilers. Such manufacturers too, find it most convenient to quickly add additional units when their plants are enlarged. ¶ The heat can be directed where it is needed, forever eliminating cold floors and cold out-of-the-way corners. There is no valuable floor space taken up by the units themselves, yet the hot air can be controlled within a restricted area of the plant, and increased or decreased at will. ¶ Thus does the Humphrey Industrial Unit Heater bear the entire heating burden, or merely augment the original system, without supplanting it—all at extreme economy of operation. ¶ Further particulars will be gladly furnished on request.

GENERAL GAS LIGHT COMPANY, KALAMAZOO, MICHIGAN, New York, 44 W. Broadway; San Francisco, 135 Bluxome St.



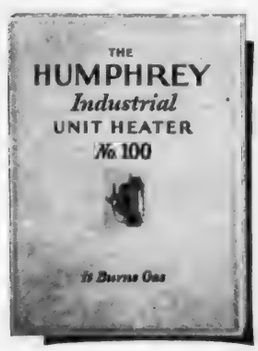
A corner of the pattern storage room of the Forest City Wallworth Run Foundry, Cleveland, Ohio.

Here one Humphrey Industrial Unit Heater maintains an above freezing temperature during the entire heating season in a room, 102′ long, 42′ wide, with a 10′ ceiling and with one-half glass exposure.

This is only one of the many outstanding examples of the efficiency of the Humphrey Industrial Unit Heater.

NO FIREMEN! NO BOILERS!
NO COAL! NO SMOKE! NO DIRT!

SEND FOR THIS CATALOG NOW!



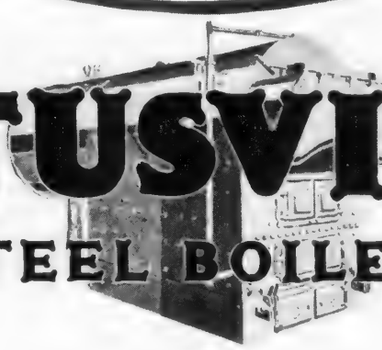
Visit the General Gas Light Company Booths at the American Gas Assn. Exhibition, Atlantic City, October 14th to 18th

At the base of every skyline

...are Titusville Boilers

Time after time they have been selected to go into the newer buildings simply because of their excellent construction and splendid performance.

THE TITUSVILLE IRON WORKS CO.
Division of Struthers Wells Titusville Corp.
TITUSVILLE, PA.



TITUSVILLE
STEEL BOILERS

TIW 13

SIX DISTINCT ADVANTAGES ARE BUILT INTO THIS SELF-CONTAINED DOWN-DRAFT BOILER

1. **Burns any fuel; coal, gas or oil.**
2. **Built to accommodate any type of stoker, gas or oil burner. (Can also be hand fired.)**
3. **Lowest water line of any boiler.**
4. **Easy to clean.**
5. **Custom-built durability (material and workmanship far above ordinary standards or requirements.)**
6. **Specially designed to give unequaled rapidity of circulation.**

The Stanwood Smokeless Boiler is a product that is original with us .... we created it. Then we built it not to a price nor to compare with any other boiler on the market, but to a standard of service which we arbitrarily set and knew from experience would be peak performance.

Oil burners can be applied either through front or rear of furnace. This is a distinct advantage. The internal construction of the Stanwood is so simple and heavy that repairs are negligible. Rapid corrosion is impossible. When these boilers are laid off, they can be completely drained, thus kept dry and free from oxidation.

To get all of the interesting details about this boiler send for Bulletin No. 500. Following are just a few of its unique features: The shell cannot be bagged or burned; neither can its circumferential seams be cracked for nowhere are these surfaces exposed to the fire; the boiler has no fire-box or mudlegs to fill up and corrode; no staybolts to rust or break off; no crown sheet to drop if water is low, or if scale or oil collect on its surface; no internal flue that can collapse.

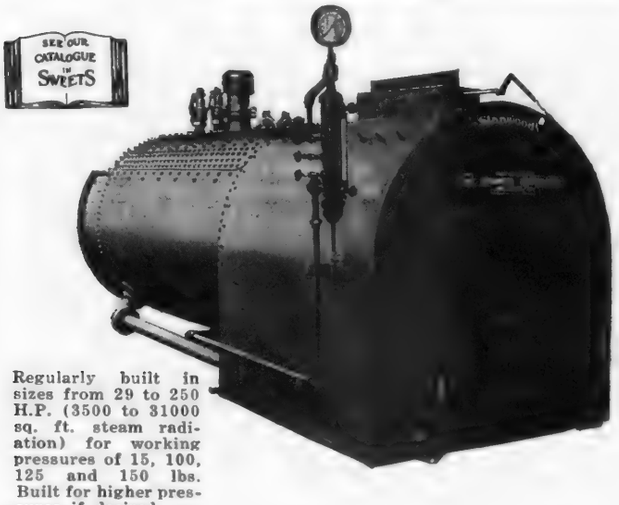
If you are figuring a job that demands the best in boiler service—write us immediately about The Stanwood. Its value is superior to any other. Using the coupon will not entail any obligations, but will afford you with unusually interesting data about an altogether different type boiler .... a custom-made boiler built to assure uninterrupted years of peak performance service. Write today.

ALL STEEL RIVETED CONSTRUCTION

Stanwood *Smokeless* Boilers

THE STANWOOD CORPORATION, Est. 1891, CINCINNATI, OHIO

Also manufacturers of Horizontal Return Tubular Boilers, Stacks, Breechings and Tanks



Regularly built in sizes from 29 to 250 H.P. (3500 to 31000 sq. ft. steam radiation) for working pressures of 15, 100, 125 and 150 lbs. Built for higher pressures if desired.

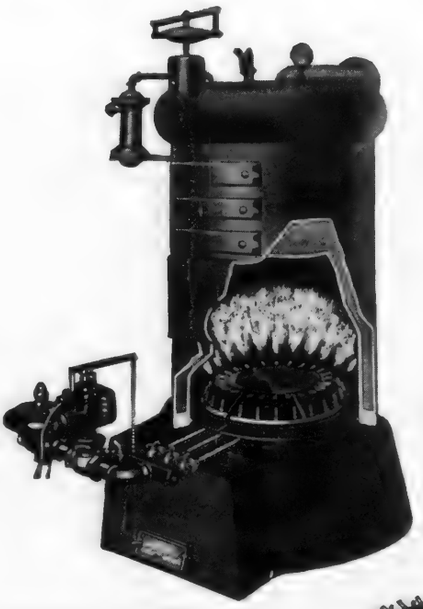
THE STANWOOD CORPORATION,
Dept. D-109, Cincinnati, Ohio.

Please send complete details about Stanwood Boilers for.....pressure and.....horsepower.

Name.....

Address.....

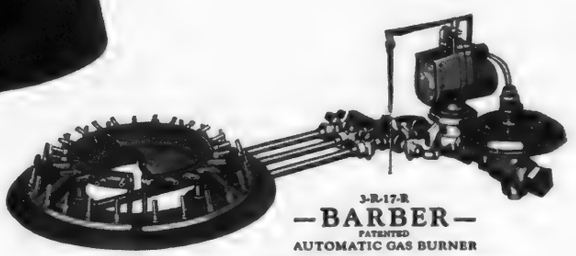
Firm.....



Illustrating the NEW Barber Automatic Jet Burner (No. 3-R-17-R) installed in a round Boiler—through the clinker door opening—without removal of the grate bars.

NOW! MAKE REAL PROFITS THIS FALL ~ AND WINTER . .

BARBER *Automatic* JET GAS BURNERS



The NEW Barber No. 3-R-17-R Automatic Jet Burner — made in FOUR standard sizes — for Grate Diameters from 16 to 31 inches inclusive — at astonishing low prices

In THREE select models—Each made in FOUR sizes—To fit every pocket book—For all sizes of Round Furnaces and Boilers — whether for Warm Air—Steam—Hot Water—or Vapor.

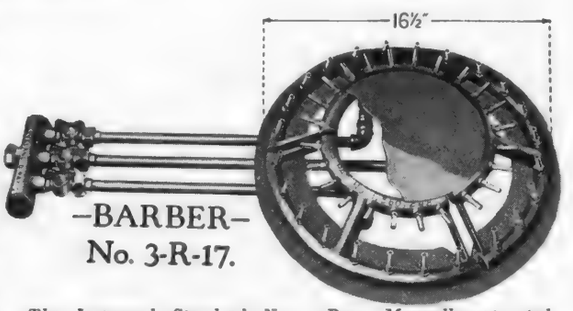
Your Customers Want Gas Heat—Why Not Give Them What They Want?

Every house heating plant in your community can easily be converted into a modern gas-burning heater—and this profitable business can be obtained easily with Barber Automatic Jet Gas Burners. Remember — we cooperate with you in obtaining this business.

The NEW Barber No. 300-R Completely Automatic Jet Burner — with or without Safety Pilot Control — made in four standard sizes — for Grate Diameters from 16 to 31 inches inclusive.

The present Furnace, Steam, Vapor or Hot Water Boiler is retained, the only change being in installation of the correct made-to-fit Barber Burner — for the particular boiler or furnace. Just write us telling the Trade Name, the Number and Manufacturer's Name of the Appliance, and we will quote you or ship at once the necessary Barber Burner Equipment to specifically suit the appliance.

Let your customers know you are equipped to make efficient gas heaters out of coal-burning boilers and furnaces—with Barber Patented Gas Burners. Do this right now! The Heating Season is here! You will find it a pleasant and profitable business.



The Improved Standard No. 3-R-17 Manually operated Barber Jet Burner — made in four standard sizes — for Grate Diameters from 16 to 31 inches inclusive.

The CLEVELAND GAS BURNER & APPLIANCE CO.
Burner Specialists
3702-04 Superior Avenue, Cleveland, Ohio

Our Contribution
to the art of Heating & Ventilation

SIX YEARS AGO when the Herman Nelson light weight, compact, indestructible radiator was placed on the market, it was immediately accepted as the greatest advance in the art of Heating and Ventilation in a generation. It has made possible heating and ventilation dependability and performance hitherto unattainable.

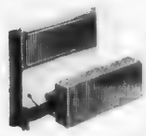
The Herman Nelson Wedge Core Radiator is an exclusive feature of all Herman Nelson Heating and Ventilating Products and accounts for their unequaled performance.

HEATING · VENTILATING · COOLING · DRYING · CONDENSING

UNIVENT

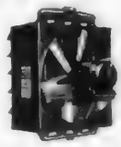
for the ventilation of schools, hospitals, offices and other buildings presenting an acute ventilating problem.

HERMAN NELSON *Invisible* **RADIATOR**



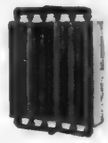
. . . supersedes all previous radiators, radiator cabinets or enclosures. Occupies no room space and makes possible any desired decorative scheme or furniture arrangement. Indestructible in service.

THE HERMAN NELSON hiJet HEATER



It operates at steam pressures from 1 to 150 lbs., and offers the better and more economical way of diffusing heat in Factories, Railroad Shops, Roundhouses, Mills, Warehouses, Garages, Gymnasiums and Industrial Buildings.

Herman Nelson Radiator Sections
for Blast Heating and Cooling



Indestructible, operating at any steam pressure from 1 to 150 lbs., non-corrosive and leak-proof.

May be arranged in banks to solve any special problem of heating or cooling.

THE HERMAN NELSON CORPORATION · *Moline, Illinois*

Builders of Successful Heating and Ventilating Equipment for over 20 Years

Sales and Service

BELFAST, ME.	UTICA	SCRANTON	SAGINAW	CINCINNATI	DES MOINES	ST. LOUIS	DALLAS	DENVER	SEATTLE
BOSTON	BUFFALO	PITTSBURGH	DETROIT	TOLEDO	MILWAUKEE	BIRMINGHAM	OMAHA	SALT LAKE CITY	SAN FRANCISCO
PROVIDENCE	PHILADELPHIA	CHARLOTTE, N. C.	CLEVELAND	INDIANAPOLIS	GREEN BAY	ATLANTA	EMPORIA	SPOKANE	VANCOUVER
NEW YORK CITY	WASHINGTON, D. C.	GRAND RAPIDS	COLUMBUS	CHICAGO	MINNEAPOLIS	MEMPHIS	KANSAS CITY	PORTLAND	TORONTO
									WINNIPEG, MAN.

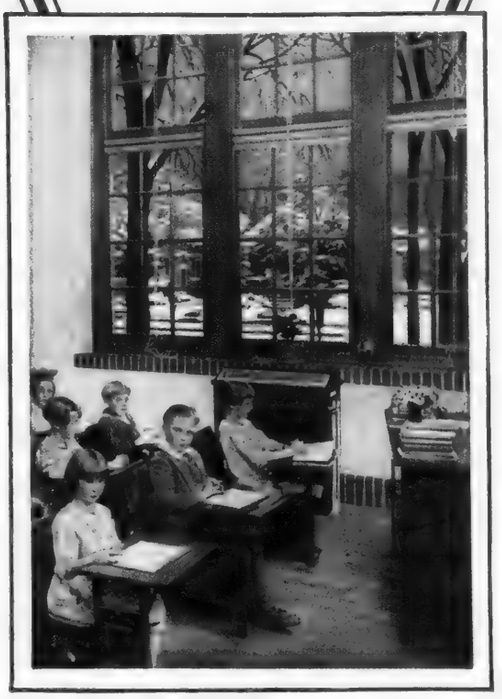
The trained mind of the engineer sees this fact:

Univent results cannot be duplicated by any other ventilating machine

IN so technical a field as heating and ventilation, only the *trained mind* can readily grasp the differences between various mechanical systems.

Other systems simulate the Univent. To the experienced engineer, the careful investigator, it is a matter of fact, however, that these imitative systems cannot duplicate Univent results. Univent features are exclusive to the Univent.

The Univent is a complete individual ventilation machine built by an organization of specialists in heating and ventilating equipment. It draws air direct from out-of-doors, cleans it, warms it to a comfortable temperature, and silently delivers it throughout the room with agreeable air motion, but without drafts.



Univent *and* Glass *make the difference*

Let us tell you of results being accomplished through Univent Ventilation in schools, office buildings, banks, hospitals, and similar buildings. Write for engineer's edition of "Univent Ventilation." The Herman Nelson Corporation, Moline, Illinois.

UNIVENT
(TRADE MARK)

Why *do* Hardinge *dealers* Stick?

Dealers agree that there is a minimum turnover among Hardinge dealers.

Several pointed conclusions may be drawn from that. The most important is that these dealers are happy and are making money.

Such a connection is a thing to prize highly, particularly right now when this entire industry looks forward to its biggest years and is in preparation for intensive selling in its fattest markets. The Hardinge Fuel Oil Burner is on an accelerating upcurve in a market of almost endless possibilities.

There are several fine territories open in all parts of the country. If you are of the caliber and disposition to join us you will undoubtedly make more here in the years to come than you could in almost any other pursuit you might mention.

The story of a Hardinge dealership is quickly told. You will see its very real advantages in a very few minutes and understand why Hardinge dealers place such high value on their Hardinge Franchise. Investigate!

You'll become acquainted with a proposition which may easily become the most important business move you ever made!

QUIET HARDINGE

Fuel Oil Burners

For Every Purse and Purpose

HARDINGE BROS., Inc. 4149 Ravenswood Ave., Chicago, Ill.

SKEPTICS *about* OIL HEAT?

NOT AFTER THEY MAKE

this "CLOSE-UP" *test*!

YOU place a chair within six inches of the Improved Challenger KLEEN-HEET. Have your prospect sit there. Ask him (or her) to tell you when the burner is operating and when it isn't.

It's the first real dramatic aid to selling in oil burner history. It makes the sale then and there.

Absolute silence of the CHALLENGER made it possible. Absolute lack of vibration.

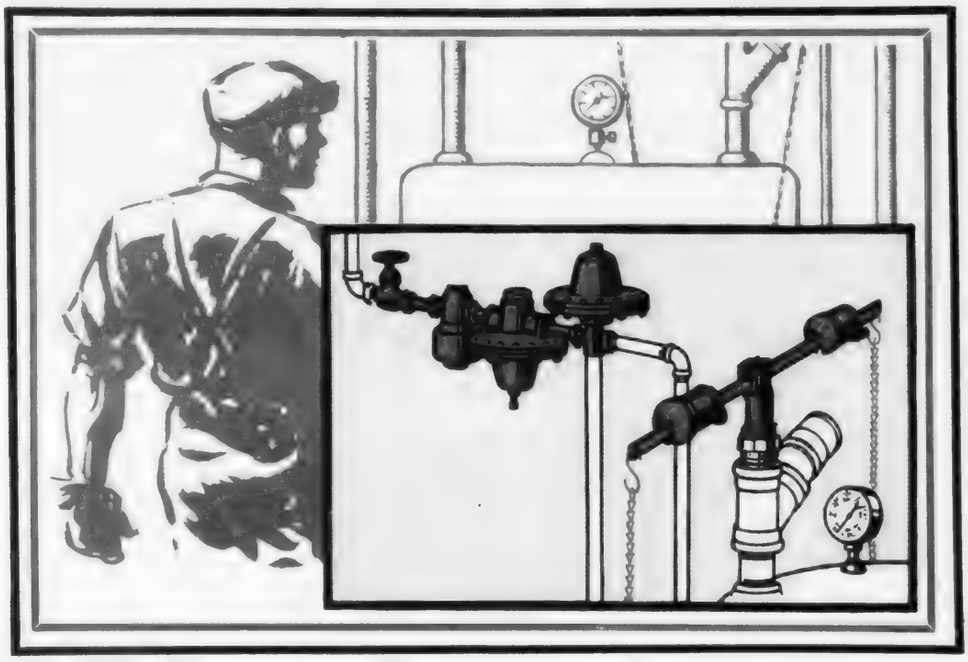
Other good oil burners? Of course! But none that are greater, point for point, than this.

It multiplies market, sales and profits. Puts an entirely new force back of an oil burner business. **Keeps** the profits for you, after the sale is made.

Want to see some surprising facts about oil burner selling and oil burner profits **as they are today?** Write.

THE WINSLOW BOILER & ENGINEERING CO., 844 Rush St., Chicago; Galesburg, Ill., 11 West 42nd Street, New York, N. Y.

Kleen-Heet



Sell easily—install quickly

There's a chill in the air that injects new life into memories of last year's heating bugaboos! Economical heating plant improvements would be good news to hundreds of people in your vicinity.

You can make extra profits this fall and winter selling and installing Mueller Automatic Heat Control Systems. Every owner of a hot water heating plant with an expansion tank is a live prospect. Mueller Systems *sell easily* because their advantages are obvious and readily explained—automatic control of water, automatic regulation of dampers, increased heat, fuel saving. Mueller Systems are *installed quickly and easily* because they are accurately constructed and simple. The price is moderate—yet there is a good margin of profit for you.

We have prepared information that has proved extremely profitable to other men in your business. May we send it to you? There's no obligation.

MUELLER CO. (Established 1857), Decatur, Illinois; *Branches*: New York, Dallas, San Francisco, Los Angeles; *Canadian Factory*: MUELLER, Limited, Sarnia.

MUELLER

AUTOMATIC HOT WATER HEAT CONTROL

The Founder of American
Selected a TRIPLE
for His

After 2 Years Service Has More Tha

When Mr. Leod Becker—founder of the American Oil Burner Ass'n and executive secretary during its first six years of existence—the organizer of Fuel Oil Journal and its President for eight years—and now President of Electrol, Inc., built his beautiful residence in Bronxville, N. Y., two years ago, he installed a Triple-Service Boiler.

Mr. Becker selected Triple-Service because of its two outstanding features. First it provides *HEAT, HOT WATER and INCINERATION in one Economical unit. Second; the elimination of numerous expensive extra equipment such as a Storage Tank, a Water Heater, an extra Water Boiler, extra Oil Burner and an Incinerator.*

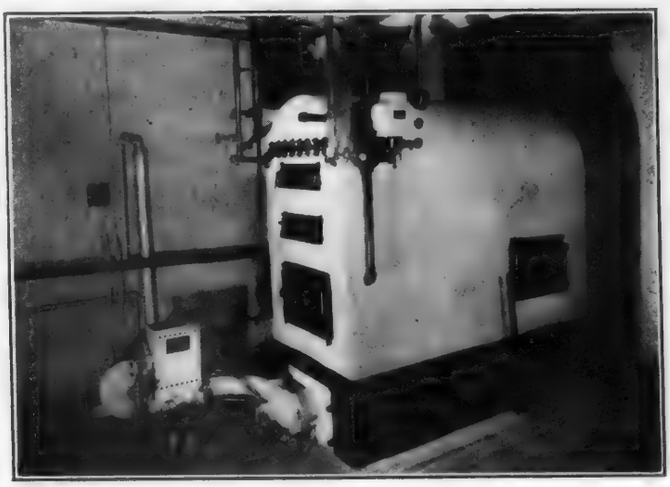
After two years of constant winter and summer service Mr. Becker is enthusiastic over this Triple-Service investment—for, having subjected his Triple-Service Boiler to the severest usages, not once has he found it failing in furnishing him *steady heat, plenty of hot water and disposing of his garbage by incineration* in the most efficient and economical manner possible.

The water tube design of Triple-Service—a feature found heretofore only in the Power Plant Boilers appeals to Mr. Becker. This construction feature is responsible for Triple-Service high heat efficiency and economy.

You Save in Installation Cost

Oil Burner Association SERVICE Boiler Own Home

Proved its Claims for Economic Efficiency



Another feature that impressed Mr. Becker is that he always has absolutely clean water without the slightest discoloration or rust, due only to the copper and brass tubes used in Triple-Service Boilers. Mr. Becker's experience in obtaining plenty of hot water during the summer season at less cost than operating a large storage tank with an extra small boiler and the 100% disposal of his garbage are facts of impressive importance.

Mr. Becker's satisfaction is characteristic of the reputation Triple-Service enjoys among its thousands of users. Designed and constructed by heating engineers, with great skill and care—to meet the most exacting boiler code requirements, and to withstand the severest usage and service under any condition—there is no greater investment today in boiler installation.

Heating contractors, builders, architects, heating engineers should study first the features of Triple-Service Boilers before deciding on any heating unit.

THE INTERNATIONAL BOILER WORKS CO.
East Stroudsburg. Pa.

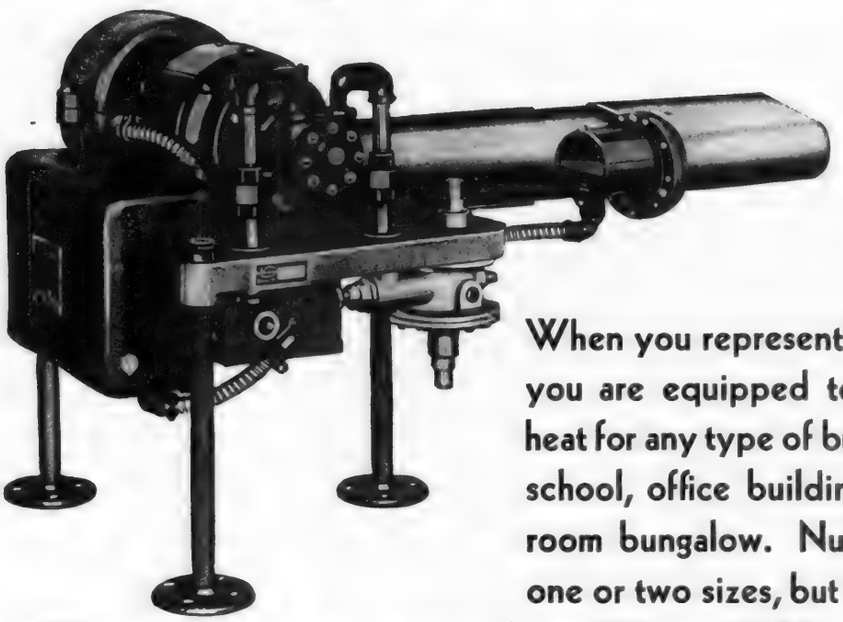
DISTRIBUTORS

THERMO SERVICE, INC.
101 Park Avenue, New York City

BOSTON HEATING CO.
1196 Commonwealth Ave., Boston

You Save in Operation Cost

A Complete Line



When you represent Nu-Way Corporation you are equipped to supply efficient oil heat for any type of building—hotel, church, school, office building down to a 4 or 5 room bungalow. Nu-Way is not made in one or two sizes, but is a complete line, the sizes ranging from 100 to 8000 square feet capacity. Nu-Way is a quality product properly made, properly priced and bears the Underwriters' label. A combination assuring dealer profit and owner satisfaction. . .Write today for more details—prices, terms, etc.

THE NU-WAY CORPORATION, ROCK ISLAND, ILL.

Nu-way

FEATURES

QUIET—Extremely quiet—no perceptible flame roar.

COMPACTLY BUILT—Fan and pump mounted directly on motor, thus conserving much space, yet all parts easily accessible. Combustion control and pump are integral parts of machine which naturally cuts installation costs.

REMARKABLE EFFICIENCY—due to extremely fine atomization and the proper mixing of air and oil.

CONTROL OF FLAME SIZE has been reduced to a simple operation.

ALL ELECTRIC IGNITION—Tested and proven dependable.

LISTED AS STANDARD BY THE NATIONAL BOARD OF UNDERWRITERS. THE NEW YORK BOARD OF STANDARDS AND APPEALS.

Nu-way

AUTOMATIC OIL BURNERS

It's **EASE OF OPERATION** proves a Constant joy for **EVERY HOME**

Always convenient, never bothersome, the ease of operation and constant accuracy of the new Penn Thermostat assure you satisfied homes wherever it is installed. Eliminating complicated hook-ups and fragile tubes, it ends much of the time and expense required for installation and servicing.

Equipped with the exclusive Penn Magnet Contact, it operates on a two degree differential. That's the reason it is so supremely sensitive. Supplied complete ready for installation. Priced comparable to standard makes. Compact. Harmonious. You are invited to test it thoroughly at our expense.

Manufactured by an organization of proven engineering ability that supplies the largest and best concerns of the country with automatic control switches.

PENN ELECTRIC SWITCH CO.

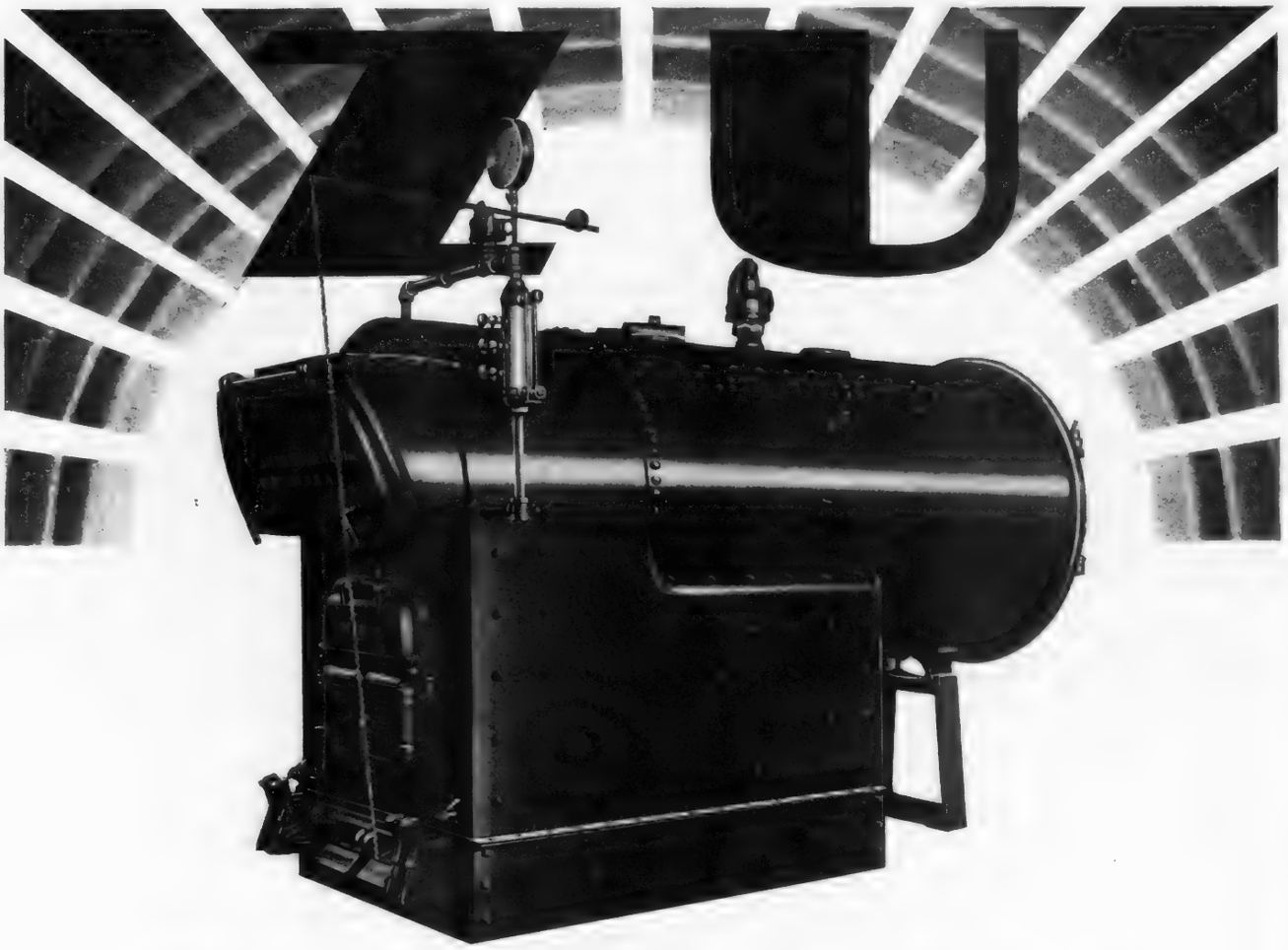
DES MOINES, IOWA

A Complete Line of Automatic Electric Switches For

Oil Burners **Pumps** **Refrigerators** **Air Compressors**

Thermostat Switches **Float Switches**

Unloader Pilots **Vacuum Switches** **Pressure Switches**



The radically different FIREBOX BOILER

The Z U is a distinct advance in firebox boiler design. It is a better firebox boiler because it adds to the time-tried-and-proven good points of the conventional design, a number of vital developments which (1) definitely improve combustion; (2) produce quicker, more efficient heat transfer.

Ample proof of the benefits of these developments is furnished by the many installations in which **more steam at substantially lower cost** is the rule.

The new Z U Boiler Catalog explains these developments and the clear-cut scientific principles on which they are based. It shows how complete combustion with minimum excess air is secured, how the thermo-syphonic action created by the design, induces a remarkably positive and forceful water circulation, why the Z U picks up the heating load with unusual speed. It also explains the many other noteworthy features of this outstanding steel firebox boiler and gives complete information as to ratings and dimensions.

Write for a copy of the Z U catalog — today.

TYPES FOR ALL FUEL REQUIREMENTS

The ZU Steel Firebox Boiler for steam or hot water heating is built in the following types:

SMOKELESS TYPE for burning soft coal smokelessly.

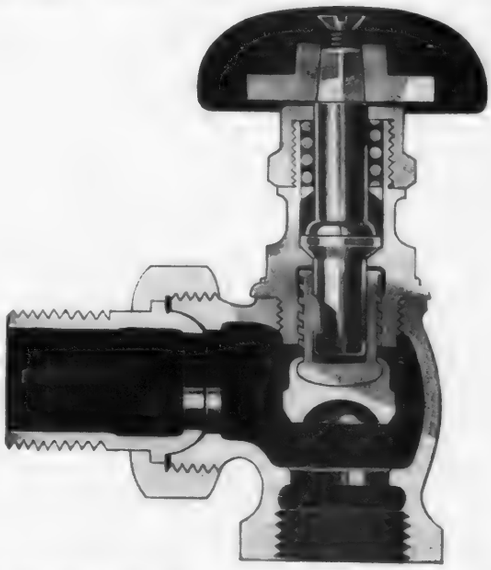
UPDRAFT TYPE for burning bituminous coal, anthracite coal, including buckwheat sizes, coke and wood.

OIL, GAS, STOKER TYPE for oil or gas or automatic stoker firing.

RATINGS—4,000 to 34,000 sq. ft. radiation.

FITZGIBBONS BOILER CO., Inc.
570 Seventh Avenue New York, N. Y.
***Works:* OSWEGO, N. Y.**
BRANCHES AND REPRESENTATIVES IN PRINCIPAL CITIES

Marsh Re-enforced PACKLESS WATER Radiator Valves



Oval Wheel
or
Lock Shield

Fig. 137

These valves are quick opening, full pipe capacity, and are GUARANTEED NOT TO STICK AT ANY TIME, OR LEAK AT ANY PRESSURE that a cast iron boiler and radiation will stand.

We believe they are the only Packless valves which will hold high pressure forced circulation and also protect against taking in of air around stem in a sealed system, *two very necessary requirements* for satisfactory service and cost no more than the cheap competition valves. Get our prices.

Marsh Re-enforced GRADUATED WATER Radiator Valves

Fig. 139

Oval Wheel,
Lever Handle
or
Lock Shield

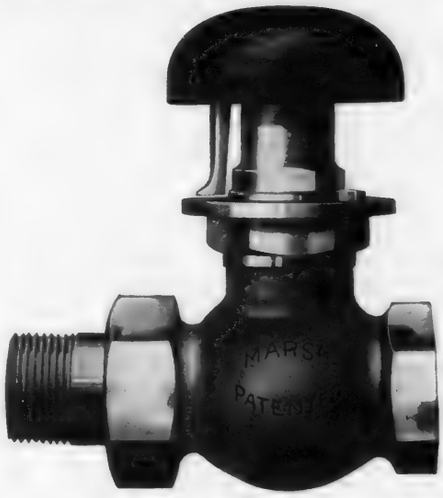


Fig. 239

With these GRADUATED Valves we regulate water heat temperature THROUGH VALVE, the same as for a vapor or vacuum steam system through a Modulating Valve. These are not only of material value for residence service, but we have tens of thousands in use for high pressure service in schools, hospitals and public buildings.

These valves cost but little more than our regular water valves and much less than steam modulated valves.

MARSH VALVE COMPANY

DUNKIRK **NEW YORK**

General Sale Distributors

Edward T. Hetherington
1709 Sansom St., Philadelphia

Appleton & Liptrott, Inc.
1480 Broadway, New York

John W. Mabbs
431 So. Dearborn St., Chicago, Ill.

UNITED STATES RADIATOR CORP'N
General Offices: Detroit, Mich.

SARCO COMPANY, Inc.
183 Madison Ave., New York

Taylor-Forbes Company
Canadian Agents Guelph, Ont.

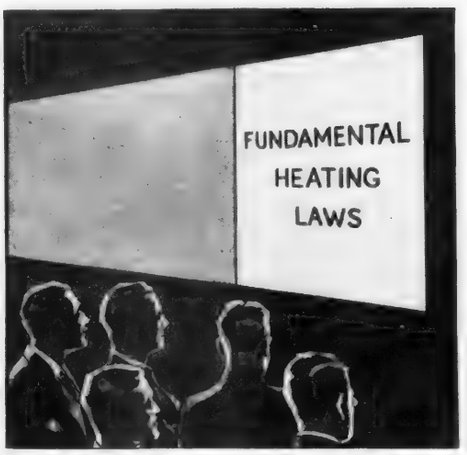
... "I CONGRATULATE *you on your* THOROUGHNESS..."

THE occasion was the showing of the York motion picture "Making B.T.U.'s Behave" before a group of engineers and officials of a prominent Eastern Corporation. They had just seen before their eyes various demonstrations explaining how the high heating efficiency of York Heat-Diffusing Units results *from correct application of fundamental laws of heat travel.* And they had seen manufacturing operations carried on which only long familiarity with the construction of floor-mounted units could make possible.

This thorough engineering background and long familiarity with structural requirements (Witness: the York Tenth Anniversary Model) explain York's huge output and the tremendous list of outstanding concerns which specify York equipment year after year.

A wide field organization with many branch offices assures easy contact, either for information or service. *Write to York Heating & Ventilating Corp'n, 1539 Sansom St., Phila.*

said this prominent Engineer *



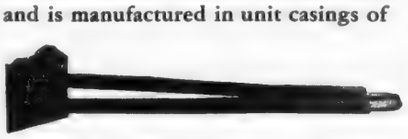
★The York film, "Making B. T. U.'s Behave," is available through York Branch Offices. It is an education in heating practice. It can be shown in your own office at any time, at your request.

YORK Heat-Diffusing Unit

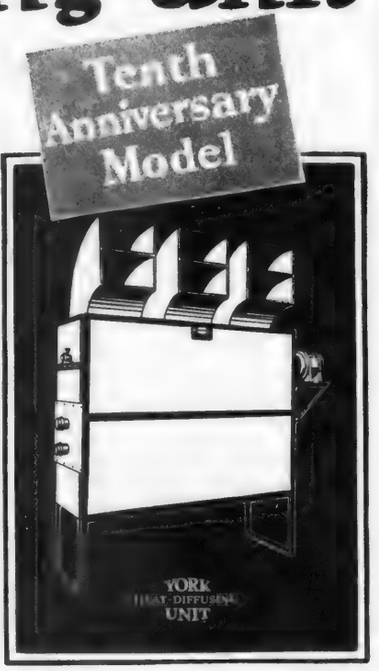
York Heating & Ventilating Corp'n, *Philadelphia*

SUPER-FIN COIL— *an example of thoroughness*

This coil quite revolutionizes all previous standards of blast radiation design. It is used in York Heat-Diffusing Units, and is manufactured in unit casings of many sizes for all blast radiation systems. No joints to leak—all fused. Good for 200 lbs. working pressure. All expansion and contraction strains eliminated by U-bend construction. Perfect drainage achieved by natural pitch of tubes. A remarkably efficient trouble-proof coil engineered thoroughly from every standpoint.

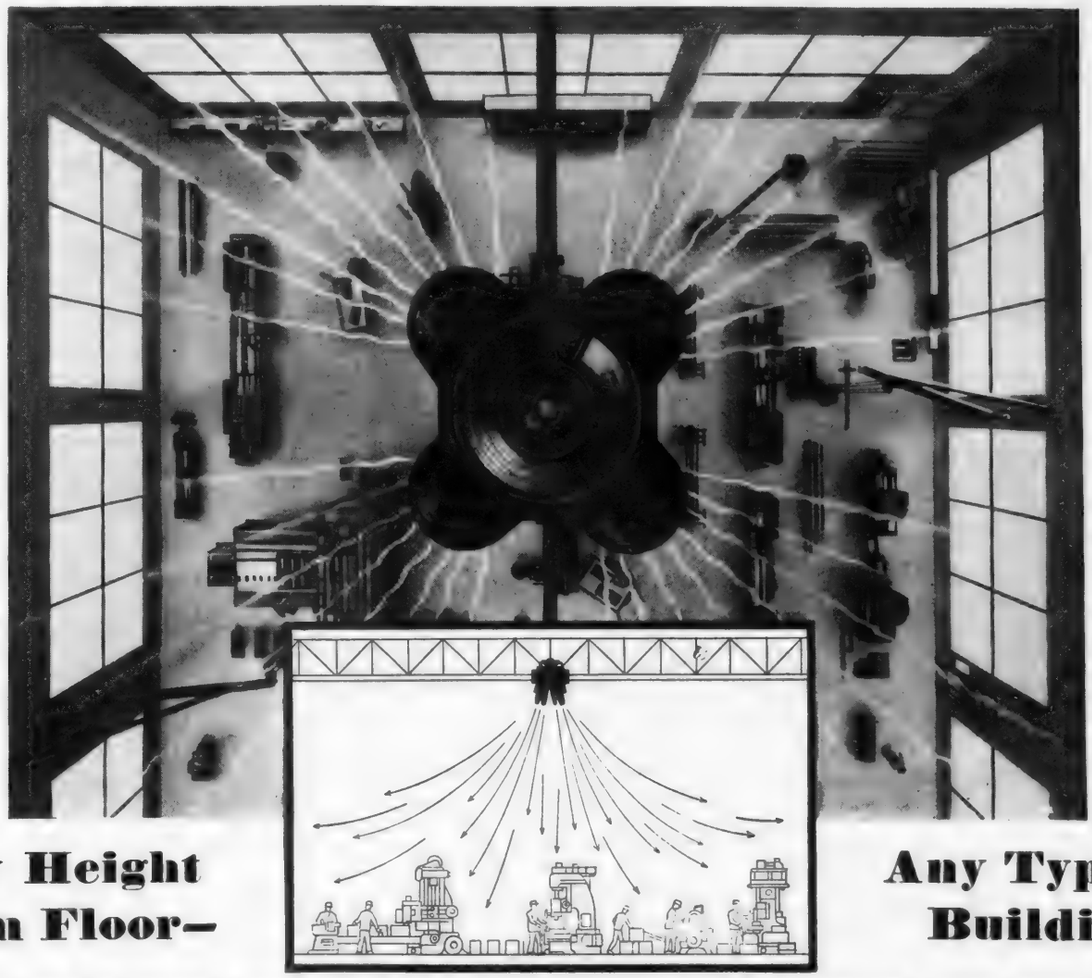


Detail of U-Bend Tube Construction



"Heat with Unit Heaters"

WING FEATHERWEIGHT



Any Height from Floor—

Any Type of Building

FOR best results a heating system must fit a building—must be *engineered* into it. Wing Featherweight Unit Heaters are designed expressly for this purpose. They permit the greatest possible range of adaptability.

1 A variety of standard discharges are used, specially designed to distribute the warmed air from any height and over any shaped area. With the proper discharge Wing Units can be installed as high as 45′ from the floor and can be adapted with equal efficiency to low ceilinged rooms.

2 Thorough diffusion of the warm air currents by these discharges is insured by the use of the highly efficient Wing Scruplex propeller-type fan to supply large volumes of heated air at high enough velocity for it to penetrate and spread through the cooler air beneath.

3 Wing Units are located directly over the area to be heated and direct their currents downward in all directions.

4 They are light enough to be installed just where they will be most effective.

When you use Wing Units you simplify your installation problems and insure the best results with a minimum number of heaters.

For a detailed description of Wing Featherweight Unit Heaters with illustrations and diagrams of their various installations, write for our new catalog.

L. J. WING MFG. CO. . . Dept. 10—158 W. 14th St. . . New York City, N. Y.

UNIT HEATERS

PLANTS OF THE AIR-WAY ELECTRIC

Air-Way Electric Appliance Corporation

THE purchase of the entire business of Erie Heating Systems, Inc., of Erie, Pa., by Air-Way Electric Appliance Corporation of Toledo, Ohio, puts a new and amazingly efficient industrial heating system into volume production and assures the availability of this new and better heating method to thousands who have wanted to adopt this new system but who have not heretofore been able to procure it.

The name of the Erie Unit Heater has been changed to "Air-Way Unit Heater," and manufacturing operations are now being carried on in buildings added to the great Air-Way plant in Toledo, to which the entire operation has been removed from Erie, Pa.

The superabundant financial, engineering and production facilities of the Air-Way Electric Appliance Corporation are now employed in the manufacture and distribution of this sensationally better factory heating system, assuring the purchaser of a perfected product, immediate delivery, and absolute responsibility for his satisfaction in use.

The Air-Way Electric Appliance Corporation is particularly well prepared to manufacture a heating unit which obtains its marvelous efficiency from new air-engineering principles, correctly applied and practically utilized. As the outstanding leader in the production and sale of home-cleaning systems utilizing air, this company has for years led the industry in the origination and application of air control engineering, and it brings to this new and great Air-Way division the knowledge, experience, and facilities

APPLIANCE CORPORATION . . TOLEDO, OHIO

Purchases Erie Heating Systems, Inc.

developed in a great, successful and permanent operation.

Air-Way Unit Heaters utilize the principle of circulating warm air downward, providing a comfortable, uniform temperature in every part and corner of the room regardless of conditions. The degree of warmth can be controlled at all times. It can be specially adapted to meet differing conditions in different parts of the same room or plant. It accomplishes this perfect and uniform temperature with less fuel consumption than other systems providing far less adequate and satisfactory results.

Air-Way Unit Heaters utilize any heat available — steam, vapor, or hot water. They can be used for cooling also with brine or cold water. Whatever may be the temperature problem, the Air-Way Unit Heater will solve it.

Air-Way Unit Heaters are installed in the *upper* part of the room, being suspended from ceilings, joists, or fastenings specially provided. The entire floor space is unobstructed. The heating element — steam, water or vapor—passes through the unit and fan-driven air is projected by adjustable louvers in any direction, horizontally, vertically, or both, as desired.

The heating section is an integral casting of alumnium—no joints, welding, flanges, brazed or soldered sections. Freezing does no harm. Galvanic action cannot injure it. Dropping or throwing it does not damage it. It is practically indestructible. It cannot leak. Although light in weight it will withstand an operating pressure of 250 pounds. Air-Way Unit Heaters can be used without change in hot water, steam and vapor systems as well as with cold water, brine or refrigerant in cooling systems. Air-Way is the modern temperature-control-system.

Write for complete information about this ultra-modern heating system. Learn how you can economically have ideal working temperatures in any and every part of your factory, shop or office. Without cost or obligation submit your heating and air conditioning problems to our large, experienced engineering department.

• • •

Air-Way
HEATING SYSTEMS DIVISION
Air-Way Electric Appliance Corporation, Toledo, Ohio

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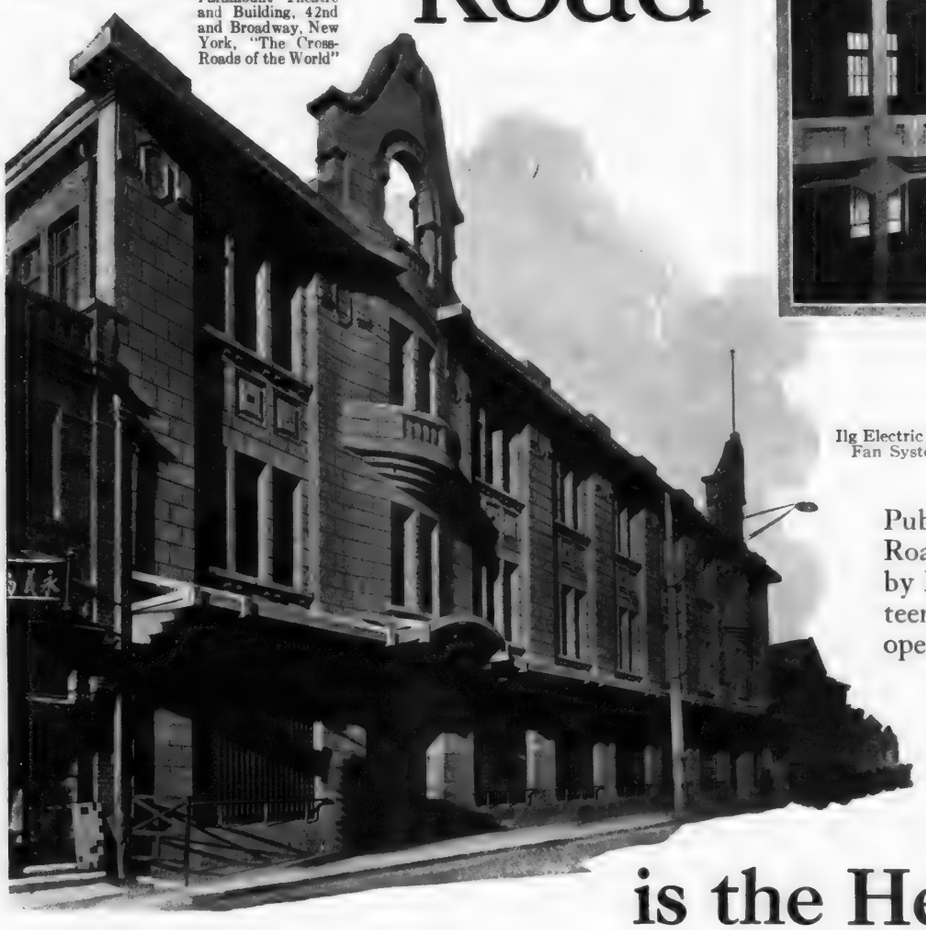

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Public Market Building, Takou Road, Tientsin, China, owned by British Concession. Fourteen Ilg-*AEROFIN* Units have operated "with entire satisfaction" since 1927.

AEROFIN is the Heat-Surface in the Master Buildings of the World!

Complete information in 128 Page Booklet with 23 Piping Diagrams in 4 Colors. Gratis to the Profession and the Trade. Ask Newark for Bulletin V-109.

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Temperature
too - is vital in Production

Heat with Unit Heaters

DO workers drop ice-cold tools and breathe warmth into their fingers? Do others mop perspiration off their sweaty brows? Are employees inefficient . . . frequently absent because of colds and similar ailments?

When machines stand idle and production suffers . . . when costly mistakes are made and profits vanish—you'll be convinced that *temperature,* too, is vital in production.

You can *control* the temperature throughout any building with the Venturafin Method of Heating . . . force heated air directly into working areas without wastefully heating ceiling areas first. Venturafins put an end to cold corners and heat pockets because they force heated air—*where* you want it, *when* you want it and as *much* as you want.

Call in any of the reliable heating contractors in your city. Ask them about the moderate cost of Venturafin Units . . . their quick adaptability to practically any position in your plant . . . their economy of space . . . their low maintenance costs and the actual *savings* in fuel that result year after year.

Ask for all the facts about Venturafin Units and how they can be most profitably applied to your business.

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MANUFACTURERS OF ALL TYPES OF AIR HANDLING EQUIPMENT SINCE 1881

Venturafin Units can be mounted on wall, column or ceiling with ordinary ¾-inch hanger pipes, an exclusive American Blower feature—or they can be used as a floor stand unit with recirculating box. They can be used on high, medium or low pressure steam applications.

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For stores, showrooms, factories, shops, garages and many other types of buildings.

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All Metal—No Perishable Parts

For a Quarter Century, at Home and Abroad, Sylphon Damper Regulators Have Fully Demonstrated Their Superior Merits

Sylphon Damper Regulator No. 23—for Low Pressure Steam Boilers

With standard weights and lever bar, this regulator will operate on pressures from 12 oz. up to 5 lbs. Pressures up to 10 lbs. can be obtained by using extra weights.

The lever bar is readily adjusted longitudinally by movement of a single clamping nut on the rocker. Weights are provided to enable proper balancing of the dampers.

No. 23-J—for Low Pressure Steam Boilers with Light Dampers

This Regulator supplies the demand for a damper regulator of superior merit for use on small steam boilers or those having light dampers which do not require much power for their operation.

With standard weights and lever, regulator will operate on pressures up to 8 lbs. Pressures up to 15 lbs. can be obtained by using additional weights.

Unequalled for Regulating Steam Pressure by Means of Damper Control in House Heating Systems

The new one piece rocker is unique, and practically frictionless. The steel casing, which encloses the diaphragm (the Famous Sylphon Bellows), is permanently fastened to the cast iron base, thus providing against tampering and damage to vital parts.

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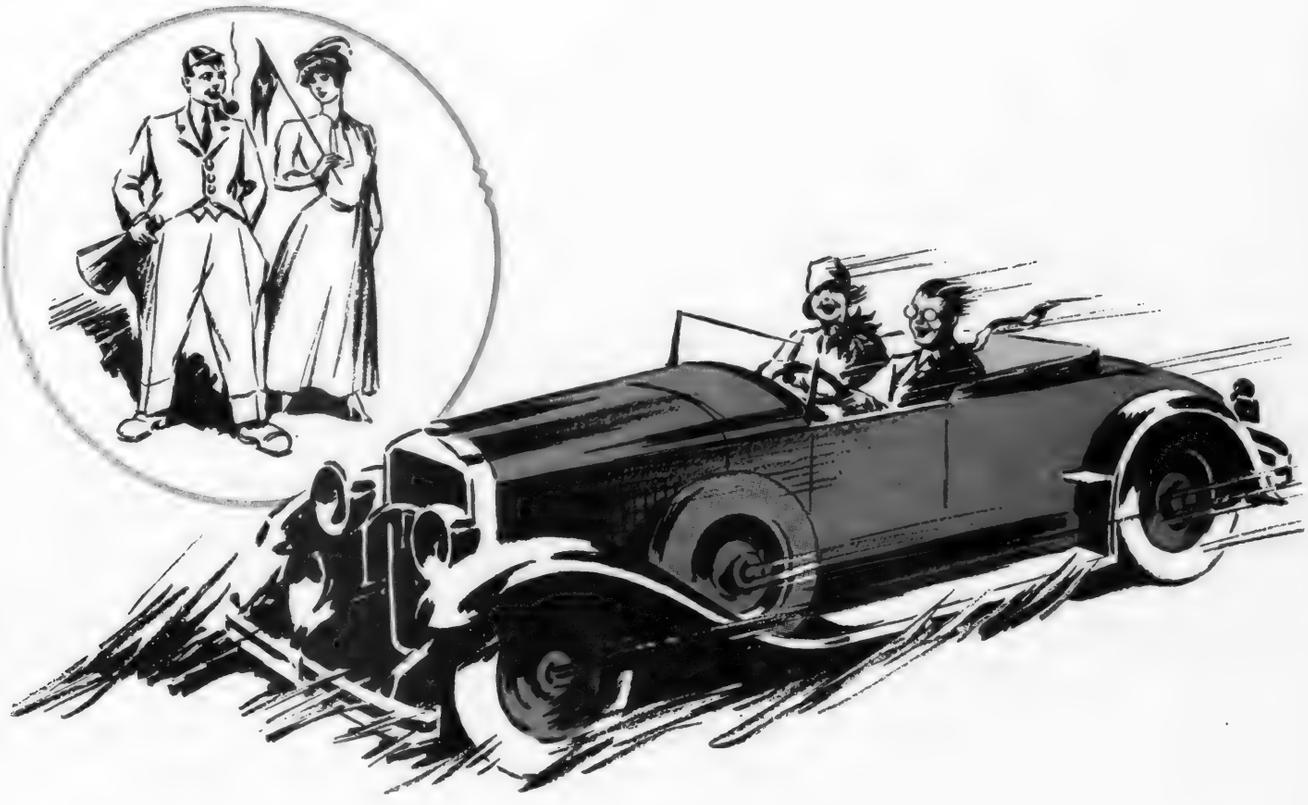

HEATING, *too*, has changed!

COLLEGE days — 1909 — 1929 — how different; how forcibly they illustrate the tremendous changes that have taken place. Industrial heating also has changed — has been "speeded-up" to meet modern needs.

Compare the performance of the Modine Unit Heater with old pipe coil radiation. The Modine suspends from the steam line; delivers heat down into the working zone instantly at the turn of an electric switch; provides the same high efficiency in heating that you get with modern lighting — because it is *controlled*. Modine Unit Heaters mean a saving on first cost and on operating cost. Let us send you complete facts.

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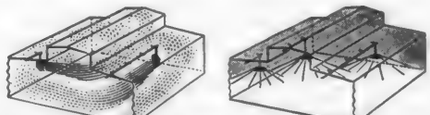
Modine Unit Heater — Model 701 — weighs only 130 lbs. — replaces over two tons of pipe coil radiation.



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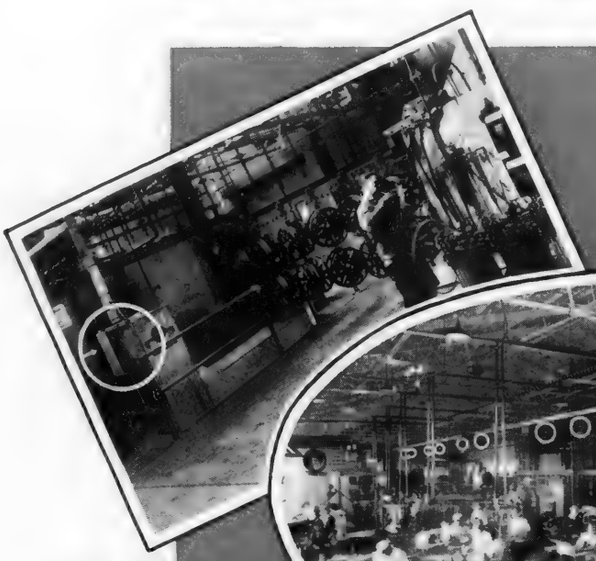
Modine

Unit HEATER

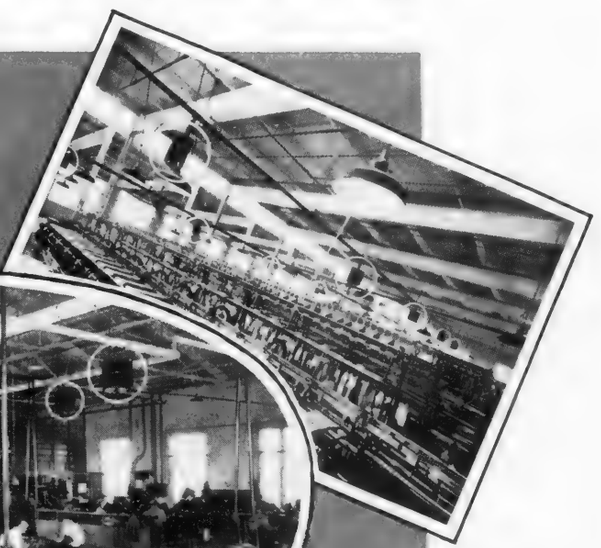
A MODINE Product

FOR STEAM, VAPOR, VACUUM, HOT WATER HEATING SYSTEMS

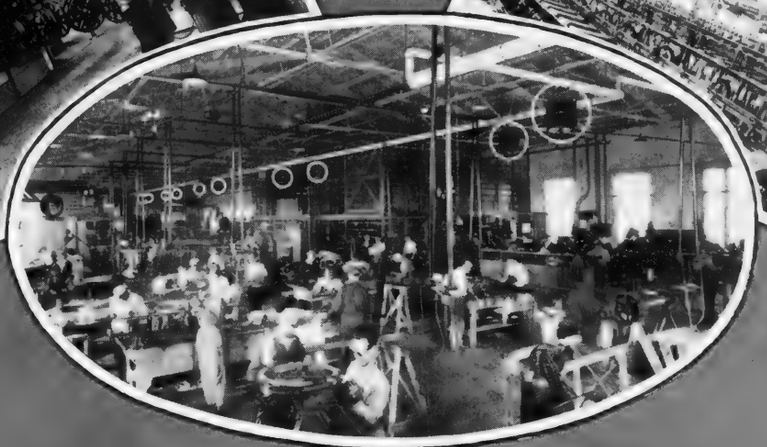
Modine *Unit* HEATER INSTALLATIONS



Drying Wheels for Nash Cars. Nash Motors, Racine, Wis.



Ten Model 701 Modine Unit Heaters satisfy the exacting temperature requirements in this eastern silk mill.

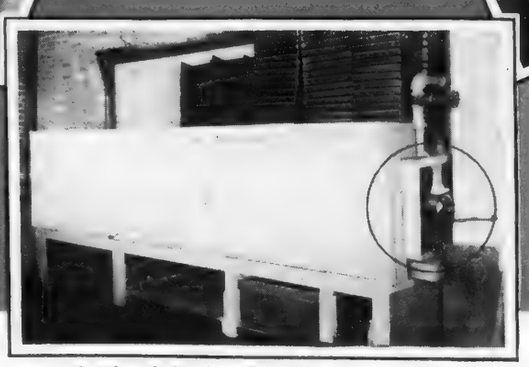


Twenty-three 701's and one 1401 installed in the new plant of Stearman Aircraft Corp., Wichita, Kan.

MODINE Unit Heaters are used in thousands of America's industrial plants — from the small to the very largest. They also are extensively used in special drying applications. What are your heating or drying problems? Modine engineers are at your service to work out the correct and economical solution.

Drying time reduced from 5 minutes to 2 minutes in the body lacquering room of the Seaman Body Corporation, Milwaukee, Wis.

Forty-five 701's and two Model 301 Units heat this great building — Northwest Engineering Company, Green Bay, Wis.



Another drying installation in the plant of the Auer Register Company, Cleveland, Ohio.

New Economy—

THE kind of economy we mean is not only low operating cost,—it's also low installation cost, low service cost and low depreciation cost.

Designed by one of the oldest and largest engineering organizations in the heating and ventilating field, Highboy and Lowboy heaters were built to do one job well—and they are doing it.

Paneled, die-stamped casings, sturdy, quiet fans, high-grade heating coils—universal motor or pulley brackets—all combined into compact units that deliver B. t. u's at the lowest possible cost—that describes Highboy and Lowboy Unit Heaters.

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This is the heating coil used in Highboy and Lowboy Heaters. It's a light weight, non-corrosive copper coil, good for any steam pressure from 2 to 200 lbs. It will drain properly in either upright or flat position. Steel slides encase the coil, protecting it, and making it easy to change steam and drip connections end for end.

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"HEAT WITH UNIT HEATERS"

"Buffalo" "Highboy" and "Lowboy" Unit Heaters

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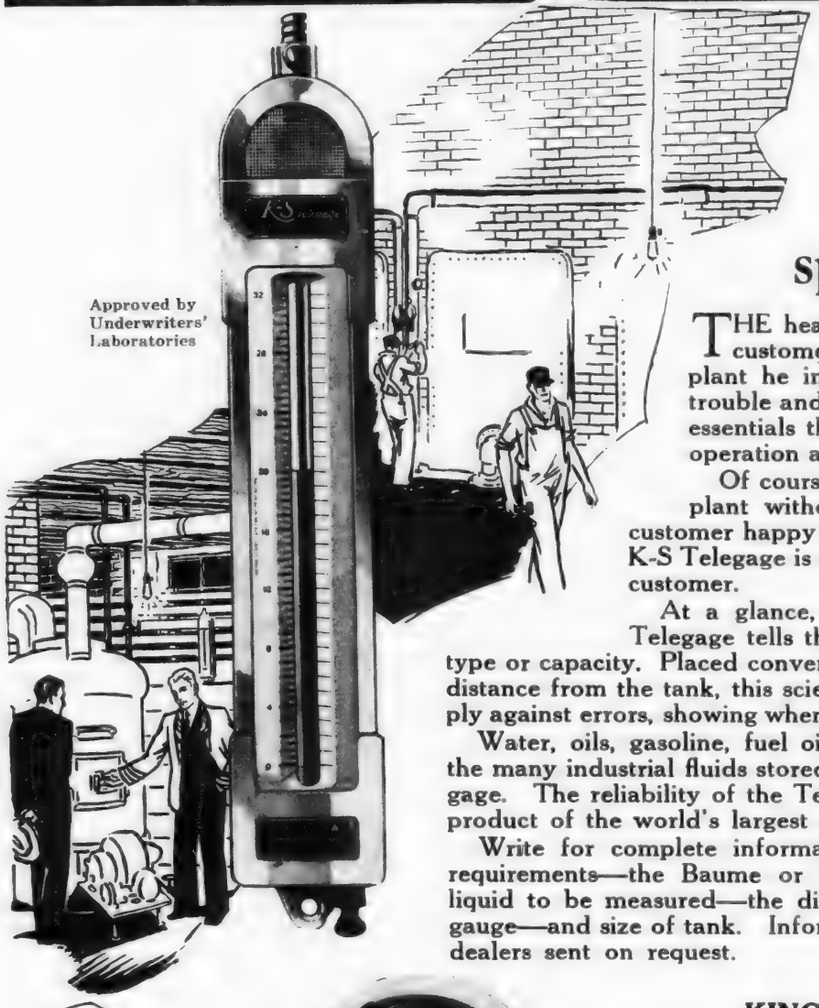

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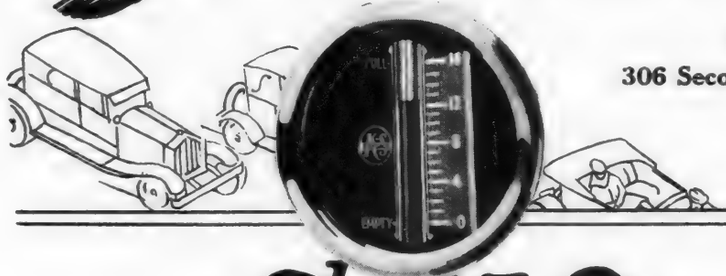
THE heating engineer should remember that his customer is going to live a long time with the plant he installs. That is why he should forestall trouble and criticism by specifying at the start those essentials that make the difference between perfect operation and dissatisfaction.

Of course you can operate an oil burning heating plant without a K-S Telegage, but to keep your customer happy and yourself free from service calls, the K-S Telegage is a good instrument for both you and your customer.

At a glance, with ease and dependability, the K-S Telegage tells the depth of fuel in storage tanks of any type or capacity. Placed conveniently in any part of the building at any distance from the tank, this scientific instrument guards the fuel oil supply against errors, showing when a new supply is needed, and how much.

Water, oils, gasoline, fuel oil, finishing materials, etc., are a few of the many industrial fluids stored in tanks and guarded by the K-S Telegage. The reliability of the Telegage is assured by the fact that it is a product of the world's largest maker of distant-reading gauges.

Write for complete information, giving a full description of your requirements—the Baume or Specific Gravity of each fuel or other liquid to be measured—the distance from tank to desired location of gauge—and size of tank. Information concerning our arrangement with dealers sent on request.



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The K-S Telegage

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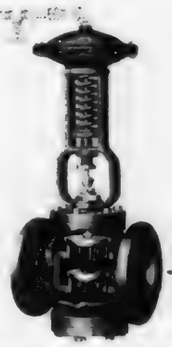
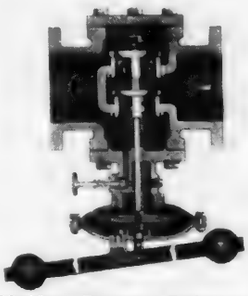
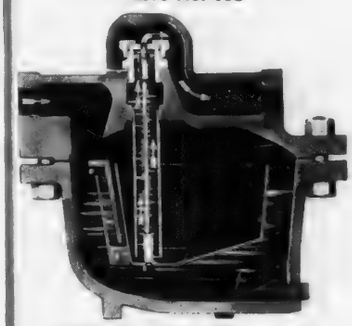


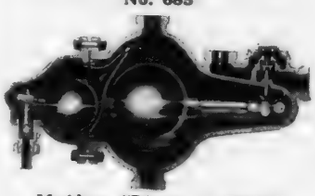
McAlear Pressure Reducing Valve No. 235



McAlear Pressure Reducing Valve No. 195



McAlear Open Float Trap No. 685



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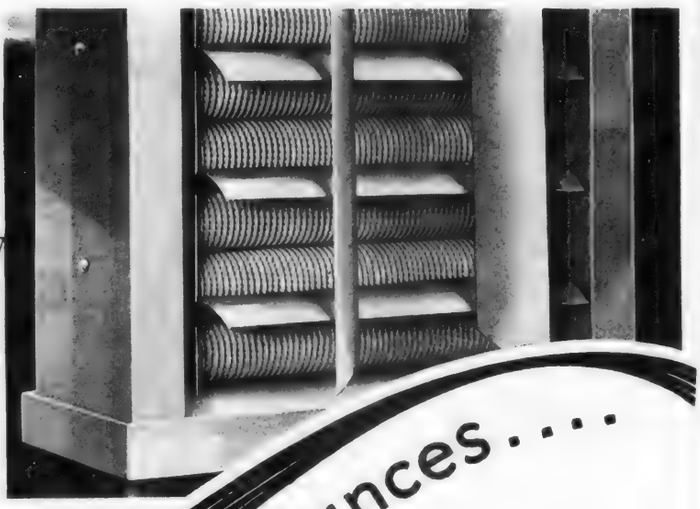

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The smallest heaters we ever made—yet the capacities are high. The design is clean-cut. Uses high-pressure Aerofin and a two-speed motor. Vibrationless, very quiet, flexible, sturdy, easy to hang and low in price . . . in fact it strikes a new low!

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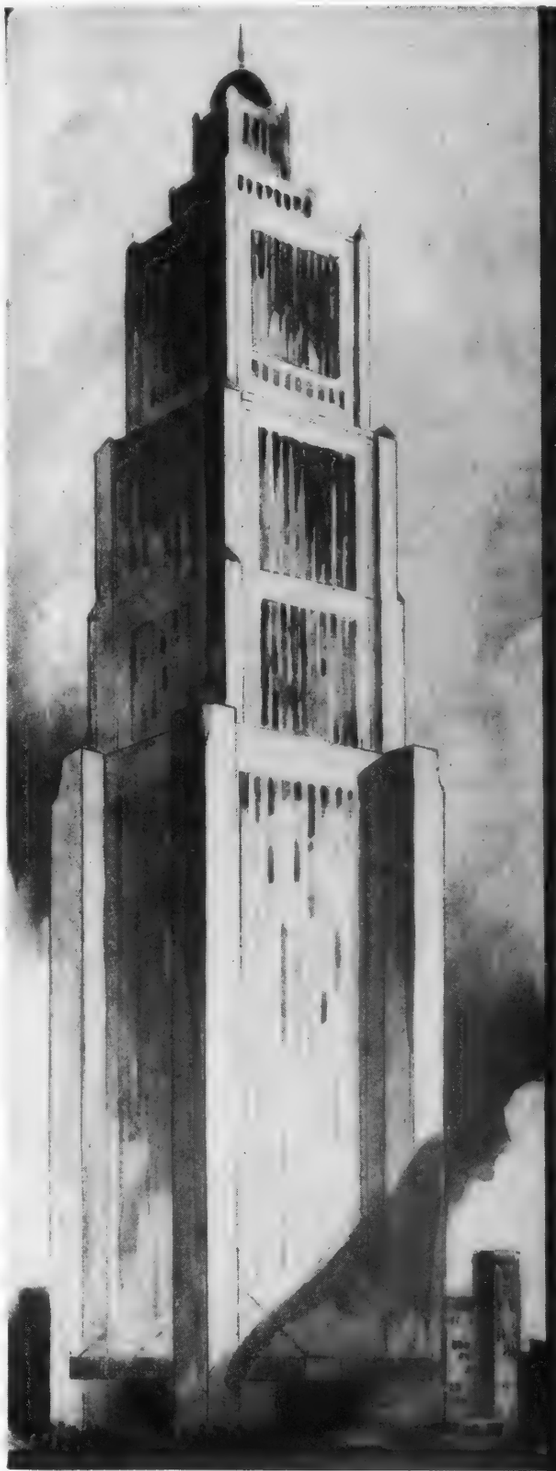

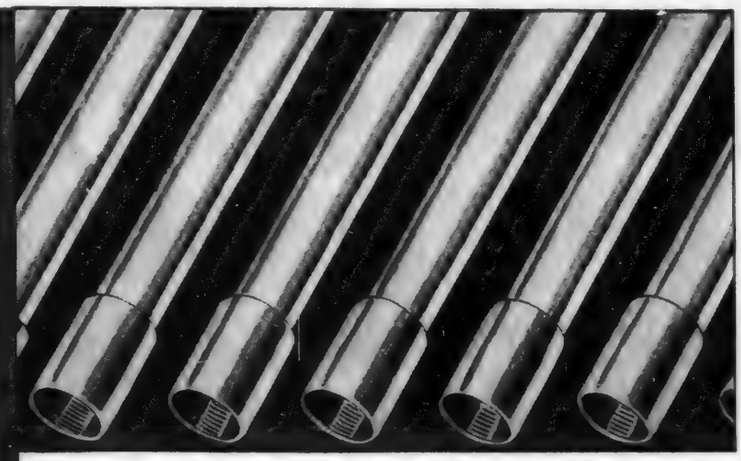

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Welded Mills: ETNA, PENNA. SHARPSBURG, PENNA.

Seamless Mills: AMBRIDGE, PENNA.

SPANG

SINCE 1828

WELDED STEEL PIPE

There is a REED AIR FILTER *for* Every Air-Cleaning Need

The REED *Standard Unit Air Filter*

—the original Reed Air Filter, introduced over seven years ago—continues to be widely used today, particularly for small installations which do not justify the cost of automatic filters, or for large installations where the labor for maintenance is readily available.

Low first cost and ease of installation resulting from standard unit construction combined with high efficiency in dust removal low operating cost makes the Reed Unit Filter the most economical of all air cleaners.

The REED *Streamline Air Filter*

is an automatic filter of the self-cleaning type, employing the streamline principle of air cleaning which offers many advantages, including high efficiency in dust removal with low resistance to air flow. The Streamline Filter is self-cleaned by the flushing method which necessitates shutting off the air supply while cleaning the filter—thus limiting its use to intermittent service such as general ventilation and certain types of industrial applications which do not require continuous 24 hour operation.

The REED *Multi-Panel Air Filter*

developed especially for heavy-duty uninterrupted service, represents the most advanced practice in modern air filtration. Its efficiency, while guaranteed 98%, is more nearly perfect air cleaning than ever before attained. The unique overlapping panel construction of the filter curtain combines the air-cleaning and self-cleaning features as an integral part of the continuous cycle of operation, making the Multi-Panel Filter applicable to either intermittent or continuous 24-hour service.

REED AIR FILTERS—*manually cleaned and automatic types*

REED AIR FILTER CO., *Incorporated,* **218 Central Ave., Louisville, Ky.**

Have You Met the Electrol Dealer

He has a money-making proposition for you

The Electrol dealer in your city has a good proposition for you... one that goes hand in hand with your regular business and gives you a new source of income.

It requires no investment, no increase in overhead or equipment. All you need to do is cooperate with him in selling Electrol Automatic Oil Heat to your regular clientele. He takes care of all servicing and installations. And you will find it a pleasure to work with this competent, well established business man who values your good opinion and respects your professional reputation.

If you don't know his name, we will have him get in touch with you and explain the details. You two can introduce yourselves... introduce your business to some extra profits.

ELECTROL INCORPORATED
177 Dorcas St. St. Louis, U. S. A.

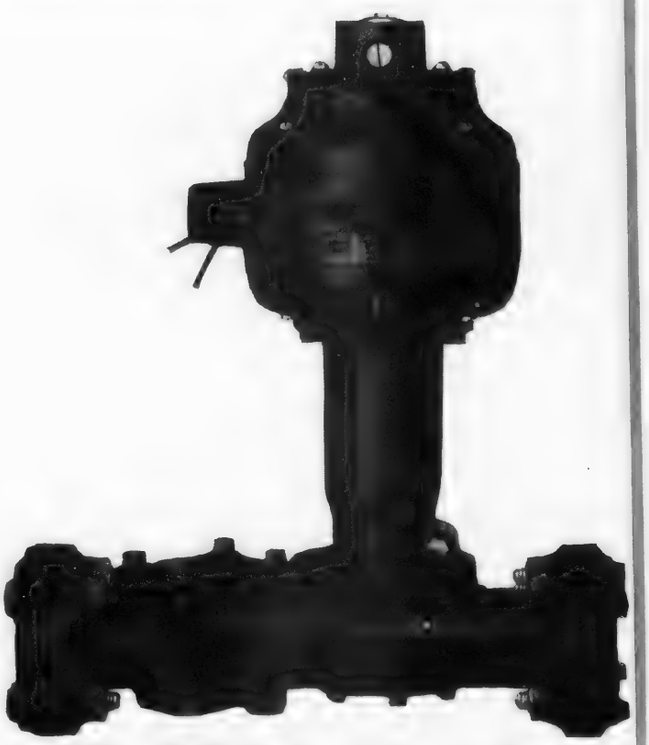
ELECTROL

The OIL BURNER *with the Master Control*

LISTED AS STANDARD BY THE UNDERWRITERS' LABORATORIES

Member Oil Heating Institute

The HYDROLATOR Makes Real Profits and Real Friends for Heating Contractors



You'll find few, if any, good-will builders in the heating trade the equal of the HYDROLATOR. Users are enthusiastic—they boast about their HYDROLATOR-equipped hot water plants. They boast about how much more heat they're getting and how much less fuel they're burning since the HYDROLATOR was installed. Naturally they put in a good word for the contractor who installed the HYDROLATOR.

Assures Rapid Circulation

The HYDROLATOR is a motor-driven centrifugal pump, which drives the water through the system several times faster than ordinary thermal circulation. It is equipped with an exclusive, patented check valve by means of which a pressure-differential between the inlet and outlet sides of the HYDROLATOR is secured.

What ONE Heating Contractor Says

. . . . "I ran the boiler last fall about 3 weeks before I could get the HYDROLATOR and the difference in temperature between the outgoing water at the top of the boiler and the return water was from 30 to 45 degrees. The tops of the radiators were heated up to about 170 degrees and the bottom radiators were about 30 degrees less than that. After the HYDROLATOR was put in operation there never was 5 degrees difference between the outgoing and return water, and the radiators were practically the same temperature top and bottom; and I never saw the temperature of the flow water over 150 degrees even in the coldest weather. . . . . I would not think of discontinuing the use of the HYDROLATOR if you were to pay me 3 times what it cost." . . .

NAME ON REQUEST

Write for Bulletin 729-H

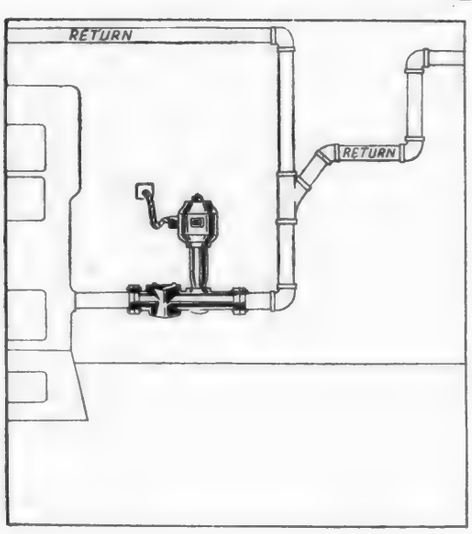
JANETTE MANUFACTURING COMPANY

Singer Bldg., 149 Broadway, New York

556-58 West Monroe Street Chicago

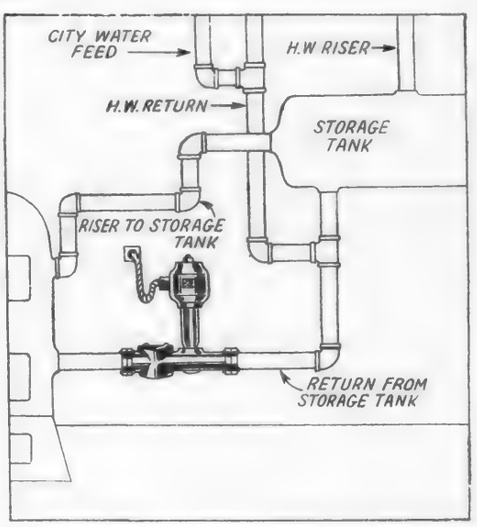
Real Estate Trust Bldg., Philadelphia

Distributors in Leading Cities



At left. Diagram of HYDROLATOR mounted on a 2-return hot water heating system. Note method of manifolding returns.

At right. HYDROLATOR mounted on a domestic hot water supply system.



A WORTHY CHOICE

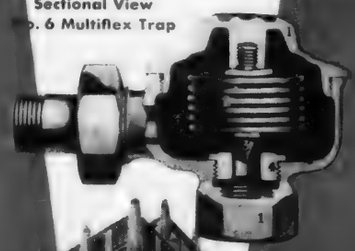
In the Paulsen Medical-Dental Building, Spokane, Washington, Bishop & Babcock Multiflex valves, traps, temperature control system and Massachusetts Fans were selected for use. Selection of this equipment was based on satisfactory past performance, made possible by long years of manufacturing experience and unexcelled facilities for production of products in this class.

THE BISHOP & BABCOCK SALES COMPANY
General Offices: Cleveland, Ohio · · Established 1879
BRANCHES IN PRINCIPAL CITIES

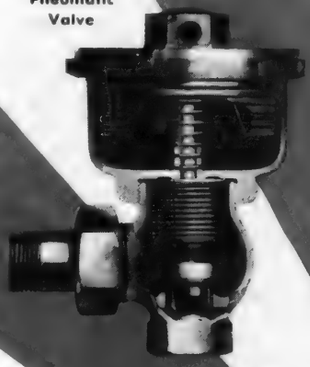
The Bishop & Babcock Line comprises Vacuum and Vapor low pressure Heating Specialties; a complete system of Automatic Temperature and Humidity Control; Massachusetts Squirrel Cage Fans, Air Washers and Unit Heaters.

Architects and Engineers who standardize on Bishop & Babcock apparatus, insure uniformity in design and operation not to be found in equipment of varied manufacture.

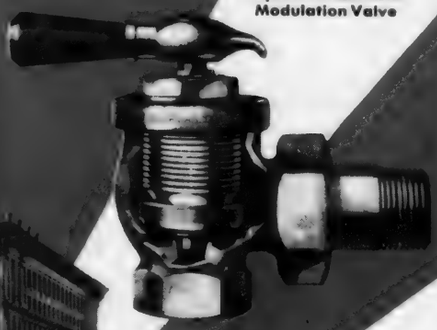
Sectional View
No. 6 Multiflex Trap



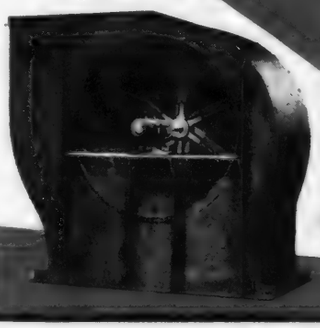
Pneumatic Valve



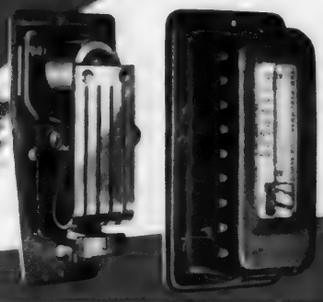
Sectional View of Special Multiflex Modulation Valve



Squirrel Cage Fan



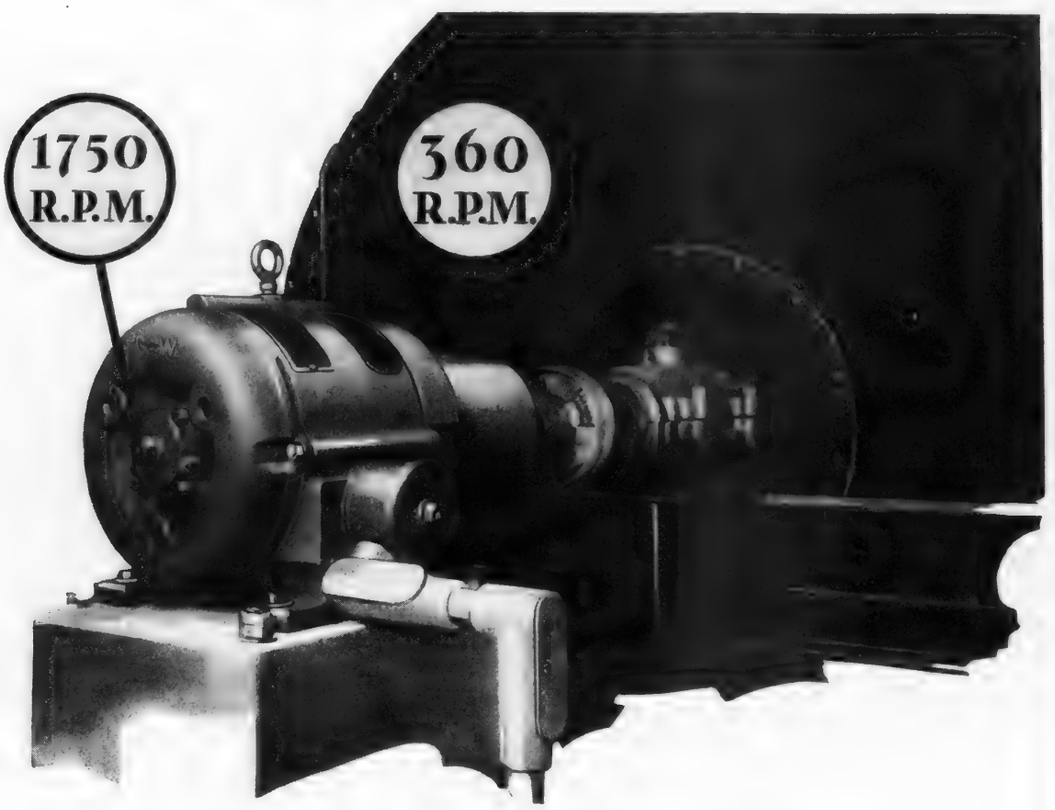
All Metal Thermostat



ARCHITECT—G. A. PEHRSON, SPOKANE, WASHINGTON
JAMES SMYTH PLUMBING AND HEATING CO., SPOKANE, WASH.

BISHOP & BABCOCK

TEMPERATURE REGULATION
HEATING SPECIALTIES VENTILATING EQUIPMENT



Design an Efficient Fan . . .
. . . *forget the Motor!*

LARGE impeller and steep pitch . . . . running at low speeds were always the fan designers millennium. But the cost of low speed motors, their great bulk and low efficiency have spelled c-o-m-p-r-o-m-i-s-e when a quiet, direct connected job was required.

But now . . . .

The Crocker-Wheeler high speed motor, with an adhesion type speed changer built into it, changes the whole situation. No more pulleys, no more belts, no more gears that are expensive to buy, noisy and give trouble . . . . all are past worries.

A motor of any size may be built with the Crocker-Wheeler Speed Changer as an integral part. Any speed change may be had within the ratio limits of 4:1 to 10:1. Have one of our engineers call and show you how you may enjoy low speed power with high speed efficiency.

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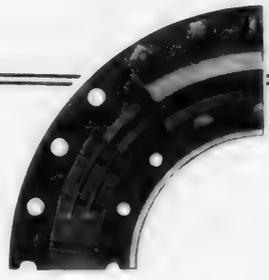
Crocker-Wheeler Electric Mfg. Co.
Ampere, New Jersey

CROCKER WHEELER

NOW . . *a Packingless Expansion Joint for* HIGH PRESSURES

ADSCO Multiple Diaphragm Variator for high pressures and high temperatures.



Flexible, non-corrosive alloy steel, corrugated diaphragm provides free flexibility. All strain absorbed through backing plates directly by body of joint. Circular reinforcing rings under corrugations evenly distribute flexing of diaphragms.

WHEREVER there is a need for an expansion device on heavy-duty pipe lines—that is a place for the ADSCO Multiple Diaphragm Variator.
In the conveying of steam, oil, or any other fluid at high temperatures—where expansion and contraction must be controlled without any possibility of leaks—and without maintenance—install ADSCO Multiple Diaphragm Variators.

Except for the use of new metals in diaphragm and body, the design of this new Variator is substantially the same as the ADSCO Low Pressure Variators, which in one installation after another have given 20 years and more sustained service, without attention of any kind. In fact, less than 1/10 of 1% of all ADSCO Variators installed have ever needed attention.

This is the kind of performance you may reasonably expect from ADSCO'S New Multiple Diaphragm Variator.

Each diaphragm accommodates full 3/4" movement, and can be assembled in series to provide for any expansion requirement up to 3" per unit. For permanent, carefree service from your piping installations, specify ADSCO Multiple Diaphragm Variator. Per inch of traverse, they cost little, if any, more than much less satisfactory and more cumbersome equipment.

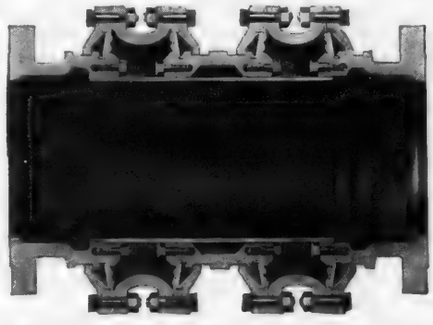
Take time now to investigate. Send for complete literature.

AMERICAN DISTRICT STEAM COMPANY
GENERAL OFFICES AND WORKS
NORTH TONAWANDA, N.Y.

4 Features that insure long service

1. Electric cast steel body. (Cast iron bodies can be furnished for pressures to 250 pounds and temperatures to 400° Fahrenheit.)

2. Inward and outward limit stops insure each diaphragm taking its proper share of movement.



3. Internal guide cylinder provides free flow of fluid — and prevents foreign matter from accumulating in joint depressions.

4. Maximum outside diameter very little larger than that of flanges.

50 YEARS IN BUSINESS

ADSCO *Multiple Diaphragm* Variator

FOR HIGH PRESSURES AND HIGH TEMPERATURES

NEW THE THRUSH ELECTRIC WATER CIRCULATOR

Cures Sick Heating!

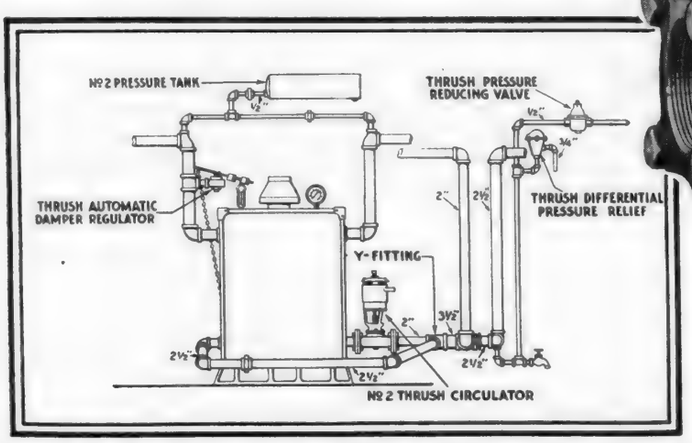
THE Thrush Electric Circulator will make sick heating plants well. *Instantly eliminates sluggish heating,* assures even temperatures at all radiators and *saves 20% to 50% of fuel consumed.*

Applied on old or new plants, it will greatly increase heating comfort and convenience. The completely Thrush equipped heating plant with Thrush Electric Circulator, Automatic Damper Regulator, Thrush Pressure Reducing Valve shown in diagram below represents the ultimate achievement in heating efficiency —the *finest and most economical form of home heating yet devised.*

H. A. THRUSH & CO.
Dept. A
Peru, Indiana

A sturdy, dependable centrifugal pump of high efficiency.

Especially designed for circulating water in a heating system.



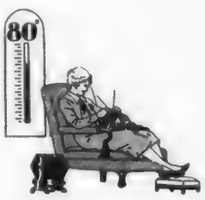
The Thrush Electric Circulator is highly recommended for oil and gas fired boilers, also for greenhouses, garages, apartments, store buildings and installations with blower unit. When designed for forced circulation, it is cheaper to install than double pipe steam and vapor jobs. Equipped with 110 or 220 A.C. 60 cycle motor for light or power line. Does not require special wiring. Very low operating cost.

THRUSH SYSTEM OF HOT WATER HEATING

don't sell cast iron

Playroom

Bed Rooms



Grandma's Room

Bath Room

Living Room

When WASH-LINES LOOKED LIKE THIS OLD-FASHIONED HEATING SERVED

It wasn't many years ago when the first of November saw all reputable and upstanding citizens snugly encased in red flannels, ankle and wrist length. Their good wives were doubtless similarly equipped, though the delicacy of the period muzzles history on this point. Dresses swept the floor, and knees existed anatomically, but not as display material.

Thus clad, these worthy folk were set to laugh derisively at winter. An excess of clothing made up for glaring deficiencies in home heating.

Not so today—changing times have brought less clothing, and with it a need for better heating. Old homes need new equipment. The alert fitter goes after this profitable replacement business, as well as the new building installations.

He is helped by the new National *Made-to-Measure* Heating systems, and the accompanying National Sales Cooperation, that reinforces all his selling effort. He can talk results instead of causes, warmth instead of cast iron. With the National Protective Payment Plan he can offer installment payments—and at the same time get his money in full as soon as the job is completed.

He is helped by the National Boiler Bond, which specifies and guarantees performance, assures customer satisfaction, protects him against criticism or complaint.

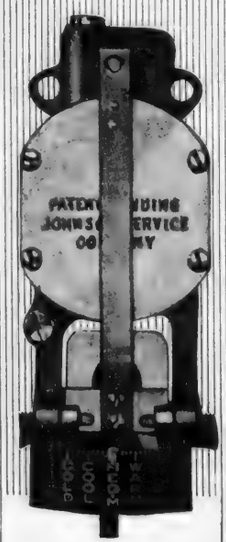
Write today for complete and helpful information that will mean bigger business, better profits, for you.

NATIONAL RADIATOR CORPORATION

Executive Offices: **55 West 42nd Street, New York, N. Y.**

NATIONAL *Made-to-Measure* HEATING SYSTEMS

Copyright 1929
National Radiator
Corporation



Johnson All Metal Intermediate Thermostat illustrated above, is a graduated acting thermostat which opens and closes dampers or valves gradually, and holds them partially open or partially closed for a long or short period, as conditions require. The Johnson Intermediate graduated acting thermostat has been on the market since 1906, and is performing with perfect satisfaction in thousands of buildings in which it has been installed; giving the *true* gradual motion to dampers and valves.

Federal Reserve Bank . . . . . Dallas

Graham, Anderson, Probst & White, Chicago, *Architects.* Mehring & Hansen, Chicago, *Heating Contractors*

NECESSARY FOR CORRECT TEMPERATURE and HUMIDITY

The ultimate object of all heating and ventilating systems is to create correct condition in a building, for the better health and comfort of the building's occupants. Production of heat and humidity and the diffusion of them are easily obtained. However, positively correct condition requires and depends upon control instruments, thermostats and humidostats of precise accuracy and efficient operation. Johnson Service Company is the originator of pneumatic thermostats and humidostats, and has been manufacturing and installing these control instruments for more than forty years. Johnson thermostats and humidostats apply to every form and plan and system of heating and ventilating apparatus with marvelously accurate results and satisfactory service, and are accepted today as standard. Write now for the book, "Johnson System Of Temperature and Humidity Control".

JOHNSON SERVICE COMPANY., MILWAUKEE, WIS.

Branches In All Principal Cities

JOHNSON HEAT and HUMIDITY CONTROL

THE PERMANENTLY ENDURING ALL-METAL SYSTEM, BACKED BY THE RELIABLE JOHNSON SERVICE INSPECTION AND ATTENTION ANNUALLY.

THE ALL PERFECT AUTOMATIC GRADUATED CONTROL OF VALVES AND DAMPERS. FUEL SAVING 25 TO 40 PER CENT PER YEAR.

Making ALL types, Skinner Brothers are

never restricted in picking the type of unit heater that *exactly* fits your building

NO *one* type of unit heater can be *exactly* suited to *every* kind of open-space building. That is why the Skinner line of unit heaters includes *all* types—floor type or suspended, steam or direct-fired, prime or extended-surface coils. And that is why Skinner engineers can always pick the type of heater best suited to *your* building, no matter what heating problem it presents.

Unit method accepted as best way to heat open-space buildings

The Skinner Brothers Method does not merely bring heat into the room and then let it float up into the unused space overhead. Fans in the units hold the heated air down where the workers need it and, by constant recirculation, diffuse warmth evenly over the entire room.

Greater length and variety of experience than anyone else

Since Skinner engineers originated the Unit Method of Heating, more than 34 years ago, they have adapted it to thousands of buildings. They have studied and successfully solved every imaginable kind of heating problem in buildings of every structural type.

Recognizing these facts, you know *why you cannot afford to plan heating without calling in a Skinner Man.*

Skinner Bros. Air Heaters

SKINNER BROTHERS MANUFACTURING COMPANY, INC.
1470 S. VANDEVENTER AVENUE, ST. LOUIS, MO.
BRANCHES IN ALL PRINCIPAL CITIES

There is a Skinner Air Heater to fit the heating needs of every type of open-space building

Skinner Bros. "Baetz Patent" Air Heater

Skinner Bros. Direct-Fired Air Heater.

Skinner Bros. "Light-weight" Air Heater

Skinner Bros. Type "U" Air Heater

The Wardman Park Hotel Cuts Heating Costs with Heggie-Simplex

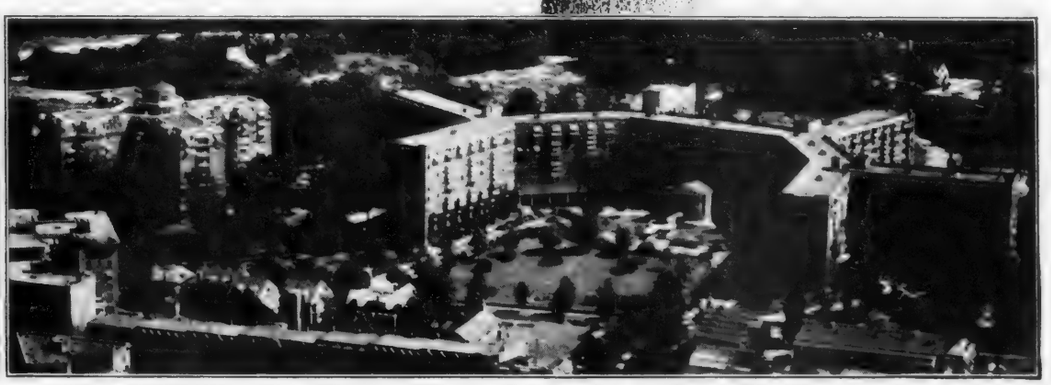
Among the prominent building operators who have turned to Heggie-Simplex for lower heating costs is the management of the Wardman Park Hotel, Washington, D. C.

Thoroughly convinced of the greater economy of Heggie-Simplex Boilers by their performance in other installations, the management is replacing the *nine* boilers previously used with *four* Heggie-Simplex Steel Heating Units. The management is confident that the new boilers, in fuel saving alone, will pay for themselves in a couple of years or less.

The huge combustion chamber, extra large direct heating surface, unrestricted circulation and rear-front-rear flue passage of Heggie-Simplex design assure maximum utilization of heat units and unparalleled fuel economy. Of crack-proof, electric-welded steel construction, Heggie-Simplex Boilers also effect substantial savings by eliminating repair expense and reducing insurance premiums.

Talk to Heggie-Simplex users. Learn first hand about the greater economy and dependability of these modern heating units. Names upon request.

Heggie-Simplex Boiler Co., Joliet, Ill.
Representatives in principal cities—telephone and address listed under "Heggie-Simplex Boilers"



The internationally famed Wardman Park Hotel, Washington, D. C., and its annex will be heated, at vast savings to the owners, with Heggie-Simplex Steel Heating Boilers.

HEGGIE-SIMPLEX
STEEL HEATING BOILERS

HEATING AND VENTILATING

formerly

The Heating and Ventilating Magazine

Contents of previous issues of HEATING AND VENTILATING *can be found by consulting the Industrial Arts Index at the nearest library.*

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No. 5 —New Series—Iso-Degree-Day Charts—Maine.

No. 5A—New Series—Iso-Degree-Day Charts—New Hampshire.

Engineers' Specification Index, Page 166.
Advertisers' Index, 174.

VOL. 26 **NO. 10**

The Battle of the Fuels

"It seems to me," said one of our manufacturer friends recently, "that HEATING AND VENTILATING is straddling the fence on the domestic fuel question. Why don't you take a stand on the subject?"

This is like asking one to declare for one particular method of heating. As a matter of fact, HEATING AND VENTILATING occupies a unique position in following the policy of maintaining an open mind with respect to the status of the standard domestic fuels.

In the last analysis the fuel which is destined to gain the ascendancy is the one that will best meet the requirements of adaptability and economy. The final word on the point has not yet been spoken. Meantime, HEATING AND VENTILATING will continue faithfully to report the significant developments in this fascinating Battle of the Fuels.

A. S. Armagnac

HEATING AND VENTILATING, formerly The Heating and Ventilating Magazine, is published monthly by National Building Publications, Division of National Trade Journals, Inc., 521 Fifth Avenue, New York, N. Y., publishers of The Architectural Forum, Building Age, Good Furniture and Decoration, and Home Builders' Catalog.

H. J. Redfield, Chairman of the Board and Treasurer; Howard Myers, President and General Manager; John Thomas Wilson, Vice-President; James A. Rice, Vice-President; C. Stanley Taylor, Vice-President; Henry J. Brown, Jr., Secretary.

Editorial and Publication Office, 521 Fifth Avenue, New York, N. Y. Branch offices:—Chicago, 75 East Wacker Drive, Telephone Randolph 0743; Cleveland, 514 Swetland Building, Telephone Main 3909; Pacific Coast and South, Blanchard-Nichols-Coleman, Los Angeles, San Francisco, Seattle, Atlanta.

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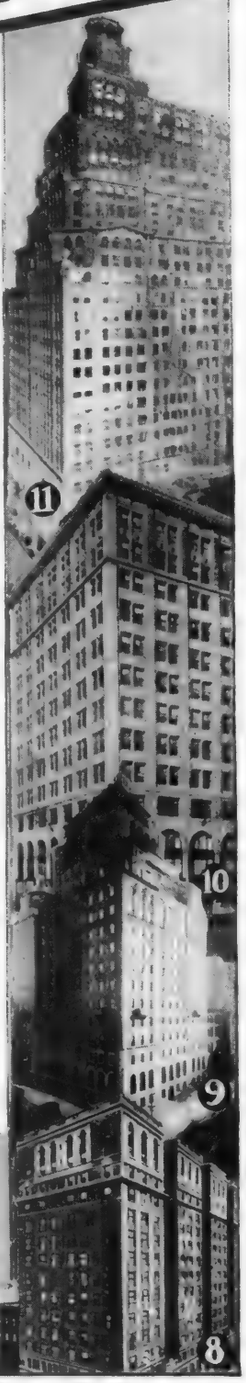
Subscription Rates—Subscription price $2 per year in United States and Mexico; $2.50 in Canada; all other countries, $3. Single copies, 30 cents.

Equipped with SARCO

...a good Heating System



The frequency with which Sarco Radiator Traps, Packless Inlet Valves and Temperature Regulators are installed in important buildings throughout the country is the highest tribute that could be paid to their high quality and satisfactory service.

A great responsibility rests on architects and engineers who select equipment for such important buildings as those shown here. They cannot afford to take a chance.

Sarco products have proved their dependability in so many hundreds of buildings that you are absolutely safe in specifying "Sarco". We stand back of every product that bears that name to the limit.

Write for interesting Catalogs Nos. P-110, P-170 and P-60

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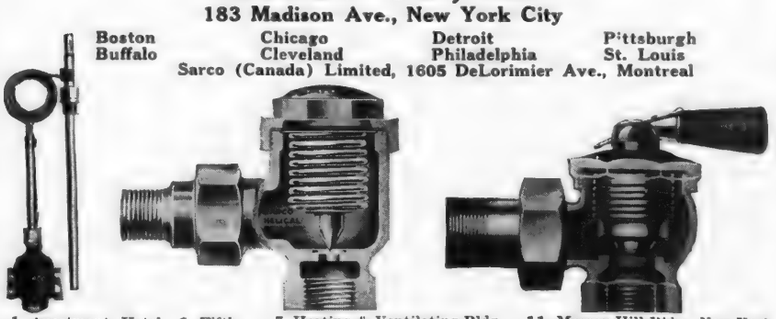


1 Apartment Hotel, 1 Fifth Ave., New York
2 Loft Building, 39th St. & 8th Ave., New York
3 Fur Craft Bldg., New York
4 Matson Bldg., San Francisco
5 Olcott Hotel, New York
6 Majestic Hotel, New York
7 Heating & Ventilating Bldg., New York
8 Times Square Hotel, New York
9 Fraternity Clubs Bldg., New York
10 Rollman & Sons Bldg., Cincinnati
11 Murray Hill Bldg., New York
12 Bellevue Hospital, New York
13 Bethlehem Hotel, Bethlehem
14 Masonic Temple, St. Louis
15 Office Bldg., 232 Madison Ave., New York
16 Farmers Bank Bldg., Pittsburgh

Radiator Traps, Inlet Valves and Temperature Regulators

HEATING AND VENTILATING

Editorial

AT LAST the contracting branches of the heating and plumbing industries have caught the merger bacillus. Not to be outdone by the combinations in the manufacturing and wholesale end of the business, some well-known contractors have taken a step which is of the utmost significance. They have formed what is nothing less than a nation-wide combination of heating and plumbing contracting firms, to operate as a single corporation. In the prospectus giving details of the merger care is taken to point out that the management and control of the corporation will remain in the hands of those who founded or succeeded to the individual companies comprising the consolidation and who have been responsible for their success. The head of each unit or division becomes a director and, in some cases, an officer of the corporation, and will remain in active charge of his division of the business. At present thirty-four heating and plumbing concerns are represented in the merger and the number may be increased to forty or more.

Particular interest attaches to the announced purpose of the consolidation which is "to apply the successfully-proven plan of group operation to one of the largest basic industries in the United States, to organize and, by unified control such as of sales, purchasing power, engineering estimating, fabrication and standardization, further to increase the success of the various units and of the whole."

THERE is nothing new in a merger of heating and plumbing contracting concerns in a given locality, but there is a decided novelty in a combination of so many contracting firms, each in a different city, and stretching clear across the continent. It is this feature, we believe, which marks the consolidation as inaugurating what probably is a new epoch in the heating and plumbing contracting field.

It is no secret that the contractors attribute most of their ills to the sharp competition among them, which has led to the widespread practice of ruinous underbidding. This matter was the main theme at the recent annual convention of the H. & P. C. N. A. Many remedies were suggested but none even remotely resembled the one which has taken form in the present merger.

One suggestion was the adoption of a credit plan for the entire construction industry in each section of the country which would operate to put out of business the mushroom type of contractor. So important was the suggestion considered that the matter was referred to the directors of the association for further consideration. In this connection alone, if the new combination should achieve even a mild degree of success, it is easy to foresee a series of similar consolidations, so that eventually the contracting end of the industry will be controlled by a limited number of dominant concerns of enormous buying power and of sufficient strength to achieve their legitimate ends.

IN MANY respects the merger is the answer of the contracting industry to the threat of the chain stores. In fact the combination itself has many chain store characteristics. Just where the jobber will fit in the picture is not so clear. However, it will not be a new experience for him to find himself between the devil and the deep sea.

From these and other considerations it is easy to see that we may be entering into a new epoch in the distribution and installation of heating and plumbing equipment. If so, the heating contractor, instead of fading out of the picture, as so many have prophesied, will come into his own on a scale not dreamt of until now.

DEGREE-DAY computations for nearly 1000 cities in the United States, which are presented in this issue, mark an important step in making this method of figuring the heating load applicable to practically every section of the country. The additional data have made it possible to redraw the HEATING AND VENTILATING Iso-Degree-Day Chart with much greater accuracy than was possible in the original chart. For most districts the general shape of the Iso-Degree-Day curves remains the same, but in certain mountainous sections, even in the east, the curves take a course which was not clearly indicated by the data previously available.

The new curves have been plotted by states and will appear in that form in HEATING AND VENTILATING. The first two are published as data sheets this month. As already announced, the series will be followed by a new set of industrial Iso-Degree-Day figures and charts, based on an inside temperature of 50° F., instead of 65° F.

An Extension of the Gas Line Is All That Was Required to Place This Heater in Operation

Gas Unit Heaters for Cramped Quarters

by **E. D. McOWAN**

Service Engineer, Consolidated Gas Company of New York

AS a means of distributing heat from a central plant evenly throughout a building, the use of unit heaters, especially in industrial plants where rooms of large volume are common, has been continually increasing in favor with heating engineers until at present it has become the approved method for doing this work. Compared with direct cast-iron radiation and other similar forms of distribution, the unit heater undoubtedly has many advantages both in application and operation.

Quite recently a practical unit of this type has been produced which not only serves as a distributor of heat but also supplies its own heat. This new unit was fired directly by gas. This means that if the unit heater system of heat distribution is decided on for a building, it is possible to install this method, and at the same time entirely to dispense with the central heating plant, and correspondingly to increase the available production or storage space as may be needed.

Unit Heaters Are Particularly Adaptable to Rooms Shaped Like This

In general appearance heaters of this type closely resemble the steam-heated type which is suspended from the ceiling. In the installation here described, the main body of the unit heater consists of vertical brass tubes through which the heated products of combustion pass. There are sixteen rows of five tubes each. Thus the air from the fan in passing over the tubes is heated. The burners, of which there are five, are located directly under the bottoms of the tubes and are enclosed in a cast-iron combustion chamber. Air necessary for combustion is taken from the fan and forced down to the burners.

The unit is suited for automatic temperature control. When the thermostat calls for heat it closes the electrical circuit and starts the fan. A flyball governor fastened to the fan motor shaft mechanically opens the valve in the gas line. Gas is then ignited by two permanent pilots, one on each side of the combustion chamber.

As the operation of the unit depends on the pilots remaining lighted, a safety device is supplied which puts the heater out of operation if the pilots should become extinguished. The device consists of a thermostatic element which when warm holds an electrical switch closed. This element is placed in a brass tube of the heater directly over one of the pilots which thus heats the element continuously. If the pilot fails the element cools and thus opens the switch in the fan circuit. A mercury switch type of wall thermostat is used for the control and may be used directly for one or two units. Any greater number may be controlled by inserting a relay in the line.

The fan, which is of the four-bladed type, is driven by a 1/6 H.P. 1150 R.P.M. motor. Adjustable vanes in front of the tubes deflect the heated air in the desired direction. One size of unit is manufactured, rated at 100,000 B.T.U. per hr. output which is equivalent to approximately 400 sq. ft. C.I.S. radiation. The fan supplies 1800 cu. ft. of air per min.

The installation here described is in a four-story brick building exposed only on the front and rear. It is a very old building and the problem was to heat the basement and first two floors which were used for a printing shop. As in many such shops there was little available floor space and much of the wall was used for shelving and machinery. The two remaining upper floors were being heated by gas steam radiators.

Basement (Shop)
Dimensions: 41 ft. x 24 ft. x 9 ft. high
Volume (one air change)

$$\frac{8856 \text{ cu. ft.}}{200} = 44 \text{ sq. ft. C.I.S.}$$

Glass (single)

$$\frac{33 \text{ sq. ft.} \times 1.2 \times 70}{240} = 12 \text{ sq. ft. C.I.S.}$$

Doors (half glass)

$$\frac{113 \text{ sq. ft.} \times 7.5 \times 70}{240} = 25 \text{ sq. ft. C.I.S.}$$

Net Wall
13 in. brick, f, l, and p

$$\frac{252 \text{ sq. ft.} \times 0.179 \times 70}{240} = 13 \text{ sq. ft. C.I.S.}$$

Floor (4 in. concrete)

$$\frac{984 \text{ sq. ft.} \times 0.556 \times 20}{240} = 46 \text{ sq. ft. C.I.S.}$$

140
North exposure 10% 14
Total 154 sq. ft. C.I.S.

First Floor (Shop)
Dimensions 41 ft. x 24 ft. x 12 ft. high
Volume (one air change)

$$\frac{11808 \text{ cu. ft.}}{200} = 59 \text{ sq. ft. C.I.S.}$$

Glass (single)

$$\frac{381 \times 1.2 \times 70}{240} = 135 \text{ sq. ft. C.I.S.}$$

Doors (half glass)

$$\frac{48 \text{ sq. ft.} \times 0.75 \times 70}{240} = 11 \text{ sq. ft. C.I.S.}$$

Net Walls
13 in. Brick, F, L, and P

$$\frac{363 \text{ sq. ft.} \times 0.179 \times 70}{240} = 19 \text{ sq. ft. C.I.S.}$$

224 sq. ft. C.I.S.
North exposure 10% 22
Total 246 sq. ft. C.I.S.

Second Floor (Office)
Dimensions 41 ft. x 24 ft. x 11 ft. high
Volume (one air change)

$$\frac{10824 \text{ cu. ft.}}{200} = 54 \text{ sq. ft. C.I.S.}$$

Glass (single)

$$\frac{236 \text{ sq. ft.} \times 1.2 \times 70}{240} = 83 \text{ sq. ft. C.I.S.}$$

Net Walls
13 in. Brick, F.L. and P.

$$\frac{497 \text{ sq. ft.} \times 0.179 \times 70}{240} = 26 \text{ sq. ft. C.I.S.}$$

163 sq. ft. C.I.S.
North exposure 10% 16 sq. ft. C.I.S.
179

Summary of Heat Loss — *Required Radiation*

Basement	154 sq. ft. C.I.S.
First Floor	246 sq. ft. C.I.S.
Second Floor	179 sq. ft. C.I.S.

The calculations of the heat losses from the building were as shown at the left.

On the basis of the above calculations one unit heater was installed on each of the floors. Although the heater is supplied with a 3-in. flue outlet so as to permit the flue products to be carried off to a chimney, no flues were run in this case as laboratory analyses have shown that the completeness of combustion is such as to make installation of a flue unnecessary except in cases where an absolutely dry atmosphere is desired.

Gas-Fired Unit Heaters Dispense with Boiler and Risers

In this particular case, the basement of the building is used as a shop and therefore a central heating plant was out of the question, but even if a sub-basement had been available for a boiler room the gas-fired unit heaters would still be the most practical choice for it makes it possible to dispense with risers and returns.

No data on the operating cost of the heaters are available as yet. However, taking into consideration the type of installation, and the mode of operation, in this particular case, the consumption should amount to approximately 900 cu. ft. of gas per sq. ft. C.I.S. radiation required per heating season in the vicinity of New York City. The heaters will be used only during the working day.

In Crowded Quarters Like This, Floor Radiators Would Have Been Impossible

Explosions in Domestic Heating Furnaces As Affected by Coal Sizes

IT generally is recognized that to fire a domestic heating furnace so that the live fuel is buried, and no flame seen above the top of the bed after firing, will cause a waste of fuel, observes the United States Bureau of Mines, Department of Commerce. This is because the combustible leaving the fuel bed, mixed with the air supplied through the slot of the firing door, will not be ignited and will pass unburned to the stack. The loss of heat will continue until the flame breaks through the fuel bed and the gases are ignited. Such losses will naturally be greater with fuels containing volatile matter which is driven off by the heat as gases, tar, or soot, but it will also occur to a less extent with cokes containing no volatile matter because carbon monoxide is formed in the hot fuel bed and carries away considerable unused heat.

It also is true that smothering the live bed with the fresh fuel is likely to result some time later in an explosion, this being caused by the flame, when it breaks through, igniting the gases present in the combustion space and flues if they are in the proportion to form an explosive mixture.

It is not so commonly recognized that the loss of heat and the probability of an explosion are related to the size of fuel used. These relationships have been brought out in an investigation being conducted at the Pittsburgh Experiment Station of the Bureau of Mines. The tendency of the relationships is illustrated by the results of tests of a fuel containing 13% of volatile matter burned in a furnace having a grate area of 2.2 sq. ft., the depth of fresh fuel fired being about 12 in.

The amount and composition of the combustible gases passing to the stack up to the time when the explosion occurred were determined, and the heat lost up to that time was expressed as a percentage of the total heat in the fuel fired. The results obtained with various sizes of fuel were as follows, where the size of the fuel is in inches, and the time interval between firing and the ignition of the gases in minutes:

Size, In. Diam.	*Minutes*	*Heat Loss, Per Cent*
½ to ¾	57	8.3
1 to 1½	47	4.4
1½ to 2	9	0.7
2 to 3	0	0.

These results show that the heat loss increased as the size of fuel decreased and became appreciable for the small sizes.

The intensity of the explosion depends on the proportionate mixture of gases and air at the time of ignition; this mixture, with a given fuel, will depend on the adjustment of the dampers of the heater, which, in general, will be more or less accidental. In these tests, in which the slot openings were adjusted to the most efficient positions the intensity decreased with the higher rate of burning.

It does not follow that the largest size of fuel will give the best economy and satisfaction; the total loss to the stack, the loss to the ashpit, the tendency for the fire to go out may be greater than for the small size. In general, an intermediate size will give the best satisfaction, but since the price of a fuel usually decreases with the size, a still smaller size can be used for the lowest seasonal cost.

Steam Jets for Heating and Circulating Water

by **JOHN C. WHITE**

Power Plant Engineer for the State of Wisconsin

THE idea of using steam jets for both heating and circulating water for warming buildings is not new. Patents were granted on the method by Great Britain in 1878, and by several countries in continental Europe shortly thereafter. The scheme never reached the commercial stage. Some of the devices were clearly inoperative and others too complicated and involved to have practical value. Like all other methods of warming buildings its field is limited, but it has decided advantages where suitable conditions exist for its proper application.

These conditions are:

1. Where there is a continuous supply of steam at a pressure of not less than 1 lb. per ft. of static head on the system.

2. Where control of temperature is or should be centralized and the occupants are not permitted to shut off or turn on radiators nor make any adjustments.

3. Where economy in the use of heat and freedom from trouble and high maintenance costs are appreciated.

4. Where a record of the quantity of steam or heat used is necessary as a basis of charges for service or apportionment of costs between different units.

These conditions make it particularly valuable for heating dormitories and other institutional buildings where steam distribution is continuous and control cannot be left to the occupants.

It is at present being used in twelve buildings at four state institutions in Wisconsin. The first installation was made in a girls' dormitory at the State Teachers College, at Superior, Wis., in 1918. It was put in as a war measure to permit heating the dormitory, already equipped with hot water and separate boilers from the central steam heating plant of the school. After operation for one year, using extemporized jets in the boiler room with the flow and return lines run above ground in wooden boxes, orders were received to make a permanent instal-

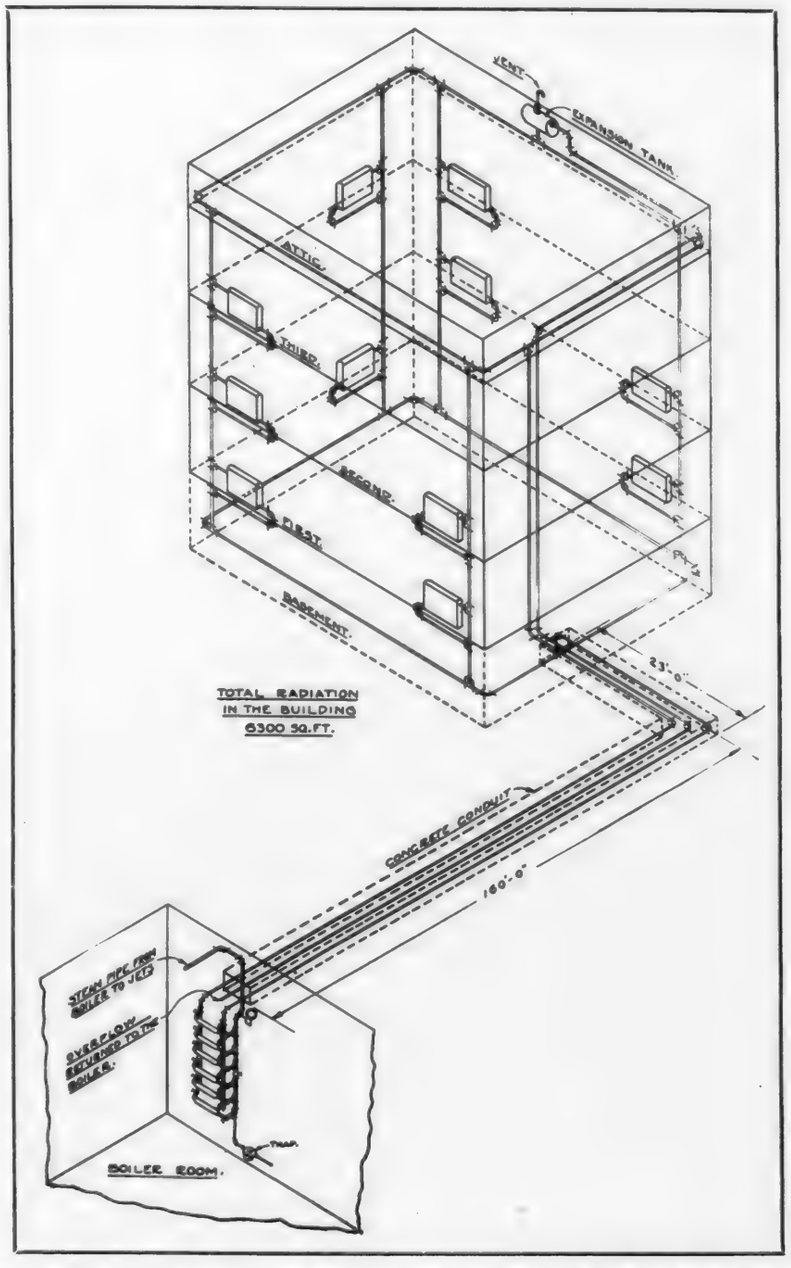


Fig. 1. Isometric Diagram of General Layout of Steam Jet Heating System

lation and to place the lines underground.

An important item in the operation of the system is the use of a chart, similar to that shown in Fig. 4, for the control of water temperatures in accordance with weather conditions. The temperature of the water and its rate of flow are controlled by using one or more jets as needed to meet the existing weather conditions. From our experience the steam and water flow should be such that there is from 18° to 22° temperature increase in the water in its passage through the jets.

The schedule of operation for zero weather, as reported by the chief engineer at the school, is as follows:

One jet from 9:00 P.M. until 4:00 A.M. keeps the water moving and prevents freezing in exposed places where windows are open. At 4:00 A.M. all six jets are turned on and by 6:30 the water temperature is 180° or higher and the rooms comfortable. Four of the jets are now shut off, leaving two to carry the load until about 5:00 P.M. when a third jet is turned on for 3 or 4 hrs.

Each jet passes about 248 lbs. of steam per hr. and the above schedule gives a total of 55 jet-hours. The total steam, therefore, is $55 \times 248 = 13640$ lbs., for the 24 hrs., and the total heat $13{,}640 \times 1055 = 13{,}708{,}200$ B.T.U. This represents the steam and heat requirements to keep the building comfortable during the active hours and allowing it to cool down during the night.

Two jets are able to maintain the temperature during the day in zero weather and, if kept on continuously during the 24 hrs., the total jet hours used would be 48, instead of 55. A third jet might be necessary for an hour or two in the early morning, but that would still leave a margin in favor of the continuous operation of two jets instead of the wide range now used.

There is doubtful economy in letting the water and building cool down and then using all available capacity to bring the temperatures up in 2 to 3 hrs. in the morning. The calculated heat loss of the building at that time, according to Carpenter's formula, was about 500,000 B.T.U. per hr. for zero weather. This figure made no allowance for distribution losses nor for windows open in sleeping rooms.

We later devised an annular steam jet, shown in Fig. 5, in which the steam enters through the annular space between the two tapered nozzles and the water enters through both the central bore of the inner nozzle and between the outside of the outer nozzle and the rounded end of the combining tube. The latter is adjustable in a horizontal direction for control of the quantity of water entering at its outer circumference. This type has a wider range of both steam pressure and water temperature without objectionable noise than the older type and it has equal or better capacity for moving the water. All of our later installations use the annular jets.

The chief advantages of the jet system are the good control of temperatures without any of the devices necessary with the various steam

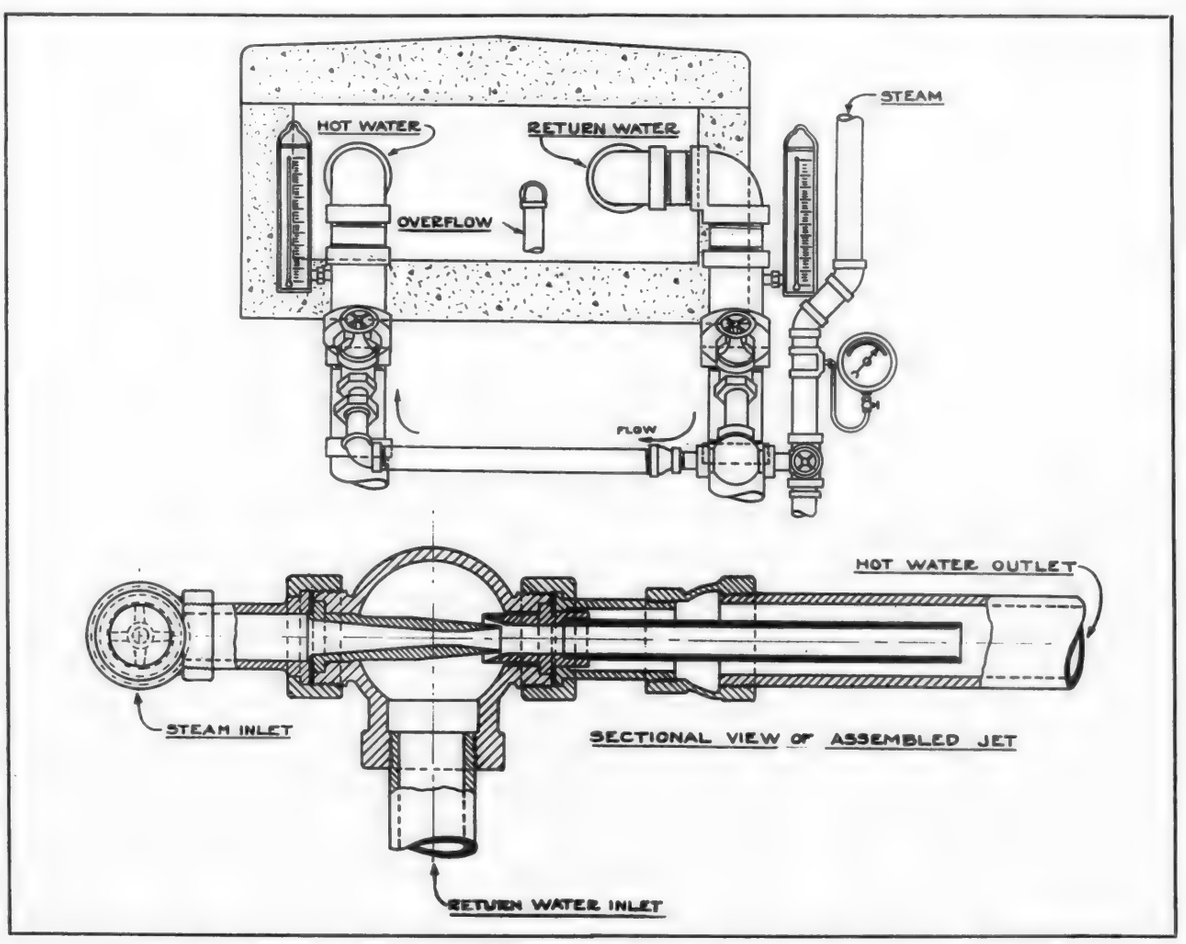


Fig. 2. (Above) Section of Conduit Where it Enters the Boiler Room, Including the Upper Jet, Accessories and Connections, and (below) Sectional View of Assembled Jet

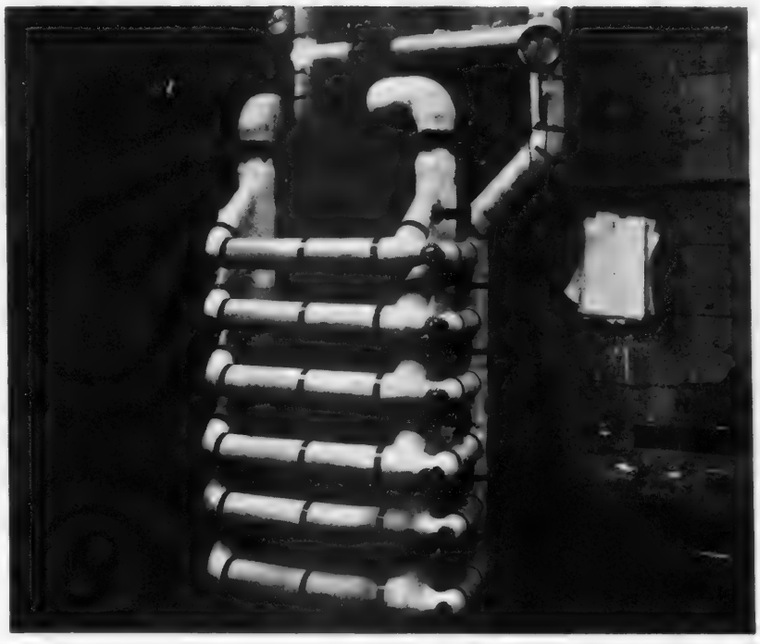


Fig. 3. Completed Steam Jet Installation
The extra pipe carries high-pressure steam for kitchen and laundry use.

systems and the resultant economy. Circulation is positive and is increased as more jets are turned on in direct ratio with the increased heat exchange and without the use of pumps.

Water temperatures of 200° to 210° F. may safely be carried, and, under test, we have gone to 220° F. This makes it possible to reduce the radiation to approximately that required for low-pressure steam and removes one of the objections to hot water systems.

In institution work high-pressure steam generally is piped to all important buildings for cooking and sterilizing and, in most cases, there is no sacrifice in using high-pressure steam, 80 lbs. to 150 lbs., for warming buildings. It costs less to distribute and can be used for all purposes. In our state institutions, except the prison and reformatory where industries cause a heavy power load during the day, power generation accounts for only 15% to 20% of the total boiler load and no exhaust steam is wasted, except perhaps during a few weeks in the warmest weather. One such institution uses exhaust steam for warming those buildings adjacent to the plant and only high-pressure steam is distributed over the campus for use in kitchens, processes and the jet heating systems.

The jets referred to above are at the low point of the system and must have at least 1 lb. steam pressure for each foot of head above their location to permit proper entrance of the steam and insure stable action.

A system is now being developed by which we hope to operate low-pressure jets at the top of the system and thus be able to heat buildings of any height using water as the medium and low-pressure steam as the agent. This would make each floor a separate unit with its own equipment and reduce the hydrostatic head to from 10 to 12 ft. It also would permit the use of exhaust or low-pressure steam at 3 to 5 lbs. pressure where such might be available.

In an experimental set-up we were able to induce proper flow under 60 ft. static head with 3 lbs. steam pressure and up to 170° temperature of the return water and 190° on the flow side. At higher temperatures

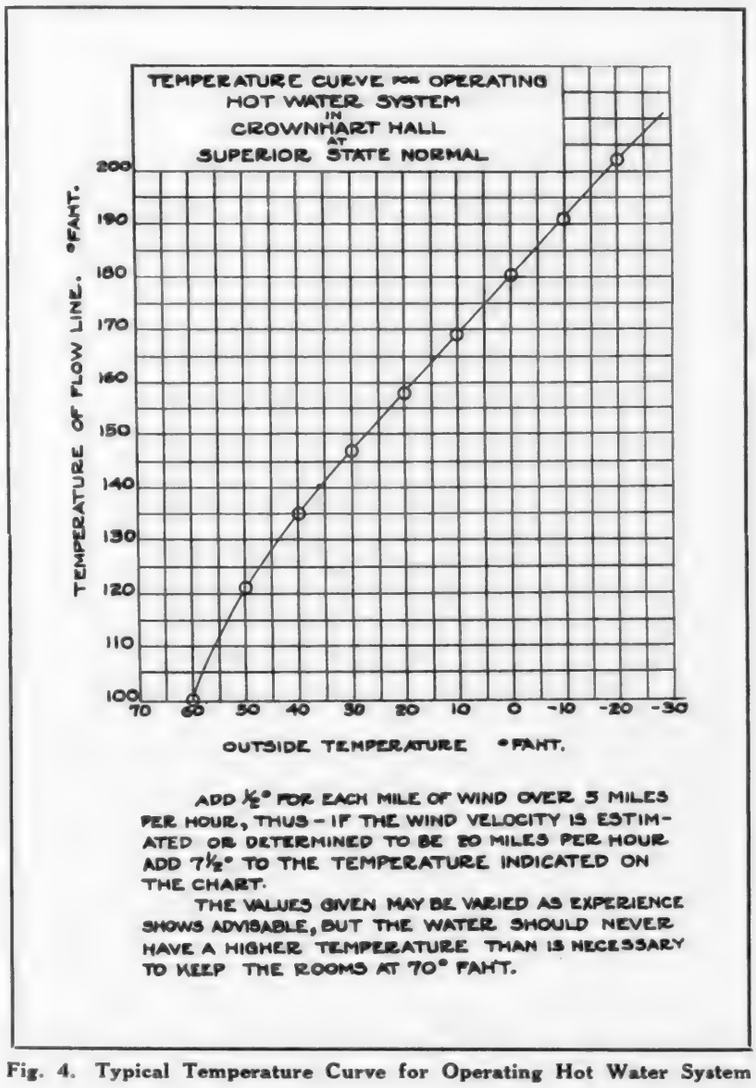

TEMPERATURE CURVE FOR OPERATING HOT WATER SYSTEM IN CROWNHART HALL AT SUPERIOR STATE NORMAL
TEMPERATURE OF FLOW LINE, °FAHT.
200
190
180
170
160
150
140
130
120
110
100
70
60
50
40
30
20
10
0
-10
-20
-30
OUTSIDE TEMPERATURE °FAHT.
ADD ½° FOR EACH MILE OF WIND OVER 5 MILES PER HOUR, THUS - IF THE WIND VELOCITY IS ESTIMATED OR DETERMINED TO BE 20 MILES PER HOUR ADD 7½° TO THE TEMPERATURE INDICATED ON THE CHART.
THE VALUES GIVEN MAY BE VARIED AS EXPERIENCE SHOWS ADVISABLE, BUT THE WATER SHOULD NEVER HAVE A HIGHER TEMPERATURE THAN IS NECESSARY TO KEEP THE ROOMS AT 70° FAHT.

Fig. 4. Typical Temperature Curve for Operating Hot Water System

the jets became unsteady. Under this plan the kinetic energy of the steam must circulate the water against its gravity differential, that is, drive the hot water down and pull the colder water up.

One-half of a small two-story shop building has been heated for several years in an experimental way by this method, using modified high-pressure jets with low-pressure steam and, while the heating has been satisfactory, we have not yet succeeded in reducing the noise to a sufficient point for general application. Special jets now are under consideration for the use of low-pressure steam.

Later installations of the high-pressure jets were three dormitories and a refectory at a training school, 1922; a dormitory and a two flat building at an institute, 1927; two receiving buildings and a custodial building at the above training school, 1929, and the superintendent's residence at a hospital, 1929.

Simplicity of Jet System Wins Favorable Consideration

The satisfactory heating and high economy of hot water, where control is centralized and always obtained, is generally conceded. And when the simplicity of the jet system and its freedom from annoying accessories, adjustments and repairs are understood, it will receive favorable consideration wherever its use is justified.

So far as the writer knows, there has been no maintenance expense on the system at Superior in the more than ten years of service since the jets were put in. The jets should be cleaned each year and examined for abrasion and wear. New nozzles are easily and cheaply installed. We substituted a smaller jet of the annular type for one of the original jets in order to economize on the night load in mild weather. This was done after several years' use and is the only change so far made.

The ratio of heat used between hot water and steam systems is not far different in severe weather, and, when steam and water temperatures are approximately the same, one is about as satisfactory as the other. Hot water has a slight advantage in being constant while steam, if under thermostatic control, is intermittent. In milder weather, which is more than 70% of the heating season, hot water has a decided advantage in both economy and comfort. This is because control of room temperatures is effected by changes in the temperature of the heating medium, instead of the intermittent use of a medium at constant temperature.

The ratio of heat used annually in hot water and steam heated buildings of comparable size and character is about as 29 to 42, and it may be applied to cost of fuel, operating attention or maintenance expense with equal assurance.

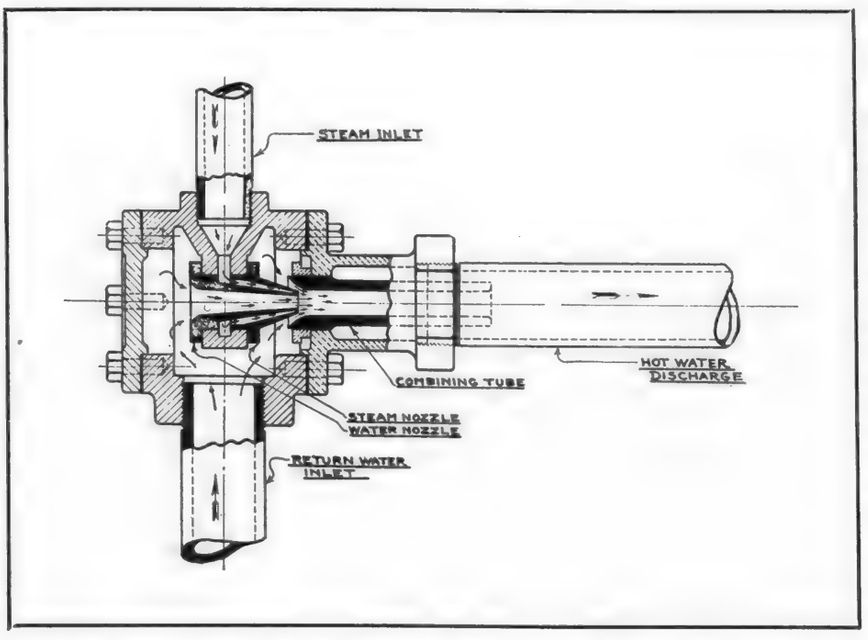


Fig. 5. Annular Steam Jet Providing for Wider Range of Steam Pressure and Water Temperature

Protection Against Fumes During Welding

Dangers may arise, when welding, but an understanding of the problem will help to overcome unhealthful operations.

According to a paper in a recent issue of *Oxy-Acetylene Tips*, gases and fumes encountered in welding may be divided into two groups, products of combustion resulting from blowpipe flames and preheated fires, and fumes produced by certain metals and metallic compounds. In the first place, gases from an oxy-acetylene blowpipe flame are perfectly harmless as they consist only of water vapor or carbon dioxide. If, however, a blowpipe is operated in a small, unventilated place or confined room, such as inside a tank, for any length of time, the oxygen content of the confined atmosphere may be reduced to such an extent that the operator will feel uncomfortable and possibly drowsy. The obvious remedy is to supply a sufficient volume of fresh air whenever welding is done in a confined space. This air should not be supplied from an oxygen tank.

Lead and zinc are the only commercial metals that cause any trouble through the production of fumes during welding or cutting. White fumes arise when welding brass, bronze, galvanized iron, or while using bronze welding rod. These are zinc-oxide fumes, which although not poisonous, may cause discomfort or even nausea. Discomfort may be avoided, however, by drinking milk before and during operations.

If the welder must work in a confined space he must have a curtain of air between him and his work. This can be done by connecting a hose from the compressed air supply to a short piece of small-diameter pipe, the other end of which has been plugged. A row of small holes drilled along the pipe permits the incoming air to escape.

Lead is more troublesome than zinc because lead compounds are cumulative poisons. Long-continued exposure to minute quantities of lead eventually will result in lead poisoning. Ordinary industrial paints contain a lead base so a welder who must work for long periods on painted material or other lead-producing metals should wear a gas mask. The best type for welders and cutters is one which covers the nose and mouth but not the eyes so that the standard welding goggles can be worn. Connection is made through a breathing tube to a canister strapped on the body. Such a mask will give complete protection against lead fumes.

In conclusion, the paper states, none of the other metals ordinarily encountered give off troublesome fumes during welding. Cast-iron cutting produces a heavy black smoke which consists of fine particles of unburned carbon and is not dangerous.

Bus Turntable in the 42nd Street Motor Coach Station of Baltimore & Ohio Railroad

Ventilating an Indoor Bus Terminal

WITH the adoption of the indoor bus terminal, the ventilation problem in such quarters has become one of major importance, due to the poisonous fumes in the exhaust gases from the motors. In the Baltimore and Ohio Railroad Motor Coach Terminal in the new 56-story Chanin Tower, on East 42nd Street, New York, the problem has been worked out in an installation which has many unique features.

Included in the equipment is a fan-blast unit heater, direct cast-iron radiation, unit ventilators used for air recirculation only, unit ventilators connected to a fresh-air shaft, two separate exhaust systems, and a unit heater supplied with fresh air from an alleyway.

Because the New York end of the Baltimore and Ohio Railroad is across the river in New Jersey, passengers are transported between the Jersey terminus and the 42nd street terminal in New York in motor coaches. Opened for use last December, the motor coach terminal is in operation every day from 6:30 A.M. to 12:30 midnight. During that time about fifty coaches carrying twenty passengers each arrive daily at, or depart from the station. With about fifty employees there, it is evident that the heating and ventilating equipment must provide comfort for over 1000 individuals daily.

The floor space has been divided into three large rooms and a few small service rooms. On the 42nd Street side is the largest room which includes a ticket office and luggage department. It extends the full 52 ft. of the terminal front, being 66 ft. deep, 22 ft. high, and having a total volume of 75,500 cu. ft.

Four Sturtevant unit ventilators were installed in this room as the main heating and ventilating equipment. Three units are located along the wall, while the fourth is placed in the balcony. Three 1500 C.F.M. units are located along the wall, while a 900 C.F.M. unit is installed in the balcony. All are equipped with Reed air filters.

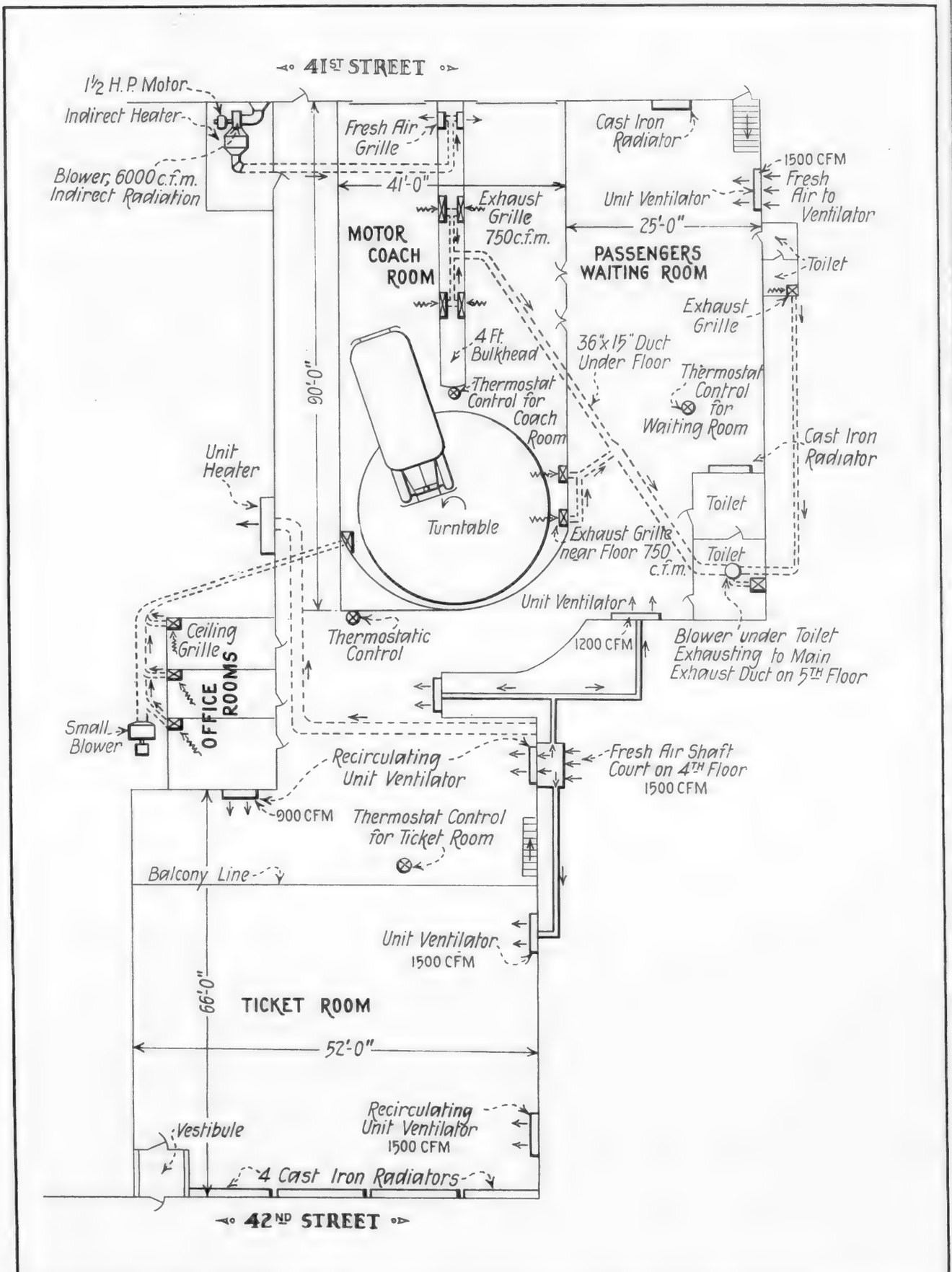
A hinged, heavy bronze grille, 54 in. square set flush with the wall, encloses the recessed unit ventilators. Beside the grille is a tumbler switch for individual motor control. Steam supply is controlled by a hand shut-off valve. In addition a thermostat on a supporting column in the room controls the air flow through the unit.

Originally, a second story was planned for the ticket office. However, this room contains only a balcony. So the balcony unit and the unit at the front of the room were left for recirculation only. Fresh air is supplied to the other two unit ventilators through a system of galvanized duct work 24 in. x 12 in. which is installed in the furred space of the basement ceiling below. As is indicated in the sketch, an air shaft delivers fresh air from outdoors to two of the unit ventilators. In addition, air filters are provided to assure clean air.

Supplementing the unit ventilators is cast-iron radiation beneath the window shelf along the entire front of the 42nd Street room. In addition, two cast-iron radiators supply heat to the entrance vestibule, to equalize the losses through doors and the large glass windows.

In the passageway leading from the 42nd Street room, there is a unit ventilator of the type already described. This unit is connected to the fresh-air supply, is 54 in. square, and is controlled by a thermostat mounted on the wall nearby.

Coming to the passenger waiting room, the equipment includes unit ventilators, and two cast-iron radiators. The unit ventilator suspended near the men's room is supplied with fresh air directly from the alleyway behind the wall. An opening is made in the wall, so that fresh air, direct from the street, passes through the



Layout of Heating and Ventilating System in the Baltimore and Ohio Motor Coach Station, Chanin Building, New York

heater and out into the waiting room.

An exhaust fan underneath the ladies' room exhausts the air from the toilet rooms and also from the coach room. Discharge is into the main discharge shaft exhausting out on the fifth-floor roof.

A thermostat on a nearby supporting column controls the two unit ventilators in the passenger waiting room. As in the 42nd Street room, no provision is made for automatic regulation of heat supplied by direct radiation.

A separate fan-blast heating system takes care of the motor-coach room. This room, on 41st Street, has two huge, motor-operated doors which remain open for several minutes at a time in all weather. Two buses are accommodated in the runways. A turntable at the rear permits the buses to be turned around in the smallest possible space.

Ticket Office and Lobby, 42nd Street Motor Coach Station

At the east end of the room is a small space containing a Skinner Brothers horizontal unit heater with a capacity for supplying 6000 C.F.M. into the coach room through three suspended supply grilles at the front end of the room. Two of these grilles are hung from the middle wall. They are 44 in. x 30 in. in size and 10 ft. high. The third grille is in the wall between the two 41st Street rooms and has a circular opening, 24 in. in diameter and set 14 ft. high.

Fresh air for the unit heater is secured from the street but 3 ft. distant. An opening 10 ft. above the street level provides an abundant supply of air. This air is passed over steam coils in winter, raising its temperature to 70° F. The volume of discharge is sufficiently large to maintain a temperature of 50° F. in zero weather.

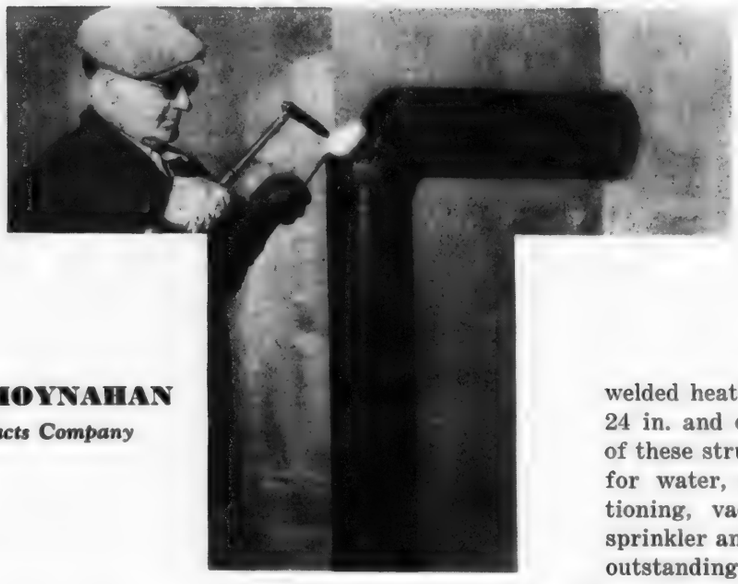
Reminiscent of the manner in which the Holland Tunnel is ventilated is the exhaust system used in the motor-coach room. This room is 90 ft. x 41 ft. and varies in height, due to ramps, from 15 ft. at street level, to 20 ft. at rear half. Its volume is approximately 70,000 cu. ft. Complete exhaustion of the foul gases generated by the gasoline motors was the requirement. Seven grilles were installed at various points to assure thorough removal. Four grilles are located in the bulkhead in the center.

Six of the exhaust grilles are operated by the fan beneath the ladies' room previously mentioned. Air removal is at the rate of 750 C.F.M., or 315,000 cu. ft. per hr.

A seventh exhaust opening is placed beside the turntable, opposite the two others. It is about 10 ft. above floor level and is connected to a small duct system exhausting the air from three small offices. This opening, like the two others near the turntable, has an area of about 200 sq. in.

Waiting Room, 42nd Street Motor Coach Station of Baltimore & Ohio Railroad

Notes on Modern Welding Practice



by **GEORGE B. MOYNAHAN**
The Linde Air Products Company

PIPE joining by welding is gaining fresh laurels in the heating and plumbing fields. We now read of large apartment houses and office buildings installing welded piping systems. Progressive heating contractors and plumbers have been quick to realize the advantages of welded construction.

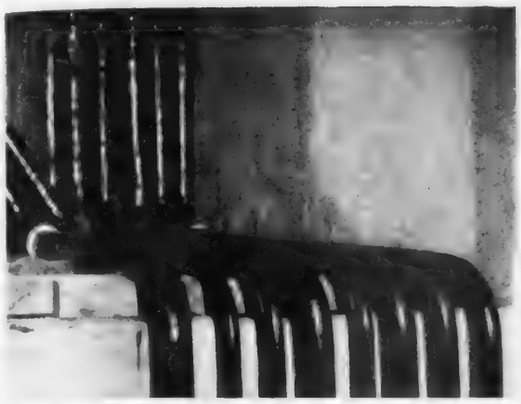
By the use of the welding blowpipe all kinds of pipe can economically and quickly be joined. This is possible whether the piping is brass, for cold water connections; copper, for water heaters or their connections; aluminum for chemical piping; cast-iron, for soil or vent pipes; or galvanized-iron, for ordinary water pipes. The cutting blowpipe as a handy companion tool to the welding blowpipe will cut steel or wrought-iron pipe directly to pattern. Thus all specials can be fabricated right on the job. If it should be necessary at some later date to make a change in an existing line such alteration presents no difficulties with these modern tools.

Some of our largest office and industrial buildings are equipped with welded heating piping in sizes up to 24 in. and over. In addition, many of these structures have welded lines for water, refrigeration, air-conditioning, vacuum cleaning systems, sprinkler and fire lines. Some of the outstanding installations made recently are those in the New York Central Building, the Cathedral of St. John the Divine, the New York Life Insurance Company Building and several public schools in New York City; the Fisher Building and the Union Trust Company Building in Detroit; the Carbide and Carbon Building in Chicago, Ill., and the B. F. Keith Building in Cleveland.

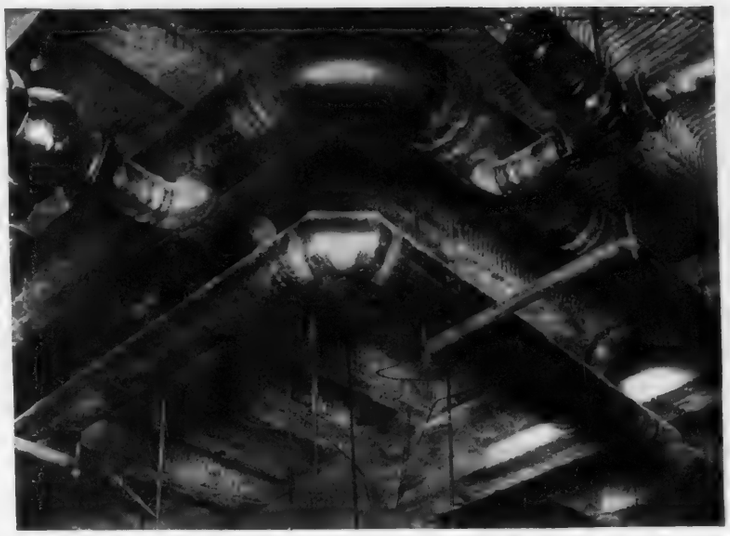
Welding heating installations, however, are not limited to large buildings. Some heating contractors make a specialty of welded installations for smaller buildings, such as residences, apartment buildings and in-

Wide Elbows Used with Welded Header for Small Boilers

Welded Return Pipe Laid in Concrete

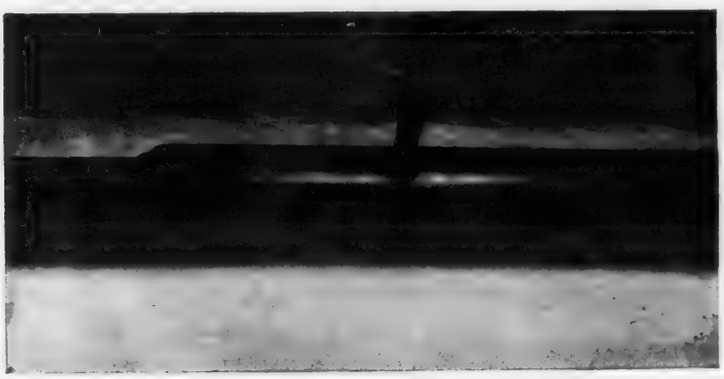


A Battery of Welded Steam Pipes with Large Radius Elbows



Two Types of Welded Elbows Used in This Main and Return

Reduction in Size Called for Unusual Looking Oxy-Acetylene Welded Reducer



Welded Eccentric Reducer and Welded Tee

Compact Installation of Welded Piping

Operator Making a Position Weld

Welding Equally Good in Industrial Buildings— or in Small Homes

dustrial buildings where pipe sizes run from ½ in. to 6 in. in diameter. An example of this is a contractor in Greater New York who has made over 100 heating installations in small apartment buildings, many of them replacements of older piping. He has organized his work so that a job can be done at a minimum cost and, naturally, with reasonable profit.

Heating contractors find that by welding their pipe lines they make savings on pipe fittings, equipment supplies, scaffolding, pipe covering and overhead. They find it an easy matter to get welding equipment at a reasonable price and speedy delivery of welding and cutting gases, thus insuring completion of contracts on time. Procedure control methods help him to make their installations sought after; the more work, the more profit.

Profits to be gained in this work depend, of course, on the experience of the men and the local conditions, but in general, it can be said that with the possible exception of one item, labor, the cost is lower. Variations of labor charges are due to several conditions, some local, some depending on the experience of the men. As more experience is gained the labor cost becomes lower.

At the present time there is no question in the minds of qualified engineers about the efficiency of a welded line. Recent tests on full-sized pipe specimens show that butt welds made in steel pipe attain the full strength of the pipe wall in nearly all cases. Pipe lines have been subjected to excessive strains through accidents or fires without injury to the welds.

Friction is considerably lessened in a welded piping installation. Long sweep bends or carefully-made miter-welded turns maintain free flow of steam or condensation. Increase in efficiency in welded lines over fitted lines has been shown to be 25% in some instances.

The freedom of design afforded by a welded installation helps greatly in this. In the first place, the weight of the pipe is to be taken into consideration. Cast fittings, either steel or cast-iron, flanges of special make, can be eliminated or reduced to a considerable extent by using a correctly-designed welded installation, and this can be done without loss of efficiency.

Elimination of Fittings Stock Reduces Capital Tie-Up

Fittings can be done away with so as to eliminate entirely stocks of small fittings in the shop, and a considerable tie-up of capital in this inventory item. It is current practice to use flanges in occasional places where accessibility is necessary, but in time even this probably will be superseded by the practice of welding the pipe directly to the valves, radiators, or boilers.

Lighter hangers can be used for a welded line, and since the joints are considerably stronger, it is not necessary to have so many hangers as with a line of similar size erected with fittings. There is no need of putting in special hangers near the joint, as there is where screwed joints are subjected to stress. The welded joint needs no extra support.

As the number of flanges, and bulky fittings is reduced, the expense of covering or lagging will be considerably less, since each extra flange or fitting necessitates molding the lagging to fit.

Welding equipment is easy to handle. Usually all that is needed on the job will be one or two welding and cutting outfits, carried for convenience on a hand truck.

Estimating is much easier to carry out in a welded line. There is no necessity of making a long list itemizing each fitting, length of pipe and hanger; no need of marking many fittings. All that is necessary is to ship to the job sufficient pipe of the necessary sizes, and to weld or cut if there are any changes to be made. If unforeseen conditions should arise any alteration required in a welded line can be arranged for on the job without the necessity of ordering a special fitting. The piping contractor is not held back in any way in his layout of the job.

Boilers, beams, walls and other obstructions, especially in old houses which are being remodeled, do not require that the contractor send away for special fitting to run his piping around the obstruction. When the pipe is being installed, it can be bent to fit or welded bends quickly made.

When there is but little room to install the pipe, welding is more convenient for there is no necessity of having room enough to swing long pipe wrenches or tongs.

Upon realizing the worth of welded piping, the heating contractor next asks, "How am I to go about it?," and this question is answered in three ways, "Get welding equipment; get welders, and get welding work."

Many heating contractors have welding work at their command; it is up to them to supply themselves with the other two items.

Welding equipment is easy to get,

reasonably priced, and its use is comparatively simple to learn. It is not to be compared with any other piece of pipe-fitters' equipment, because the welding and cutting unit will equip the contractor for a practically unlimited range of work, from smallest to largest. With reasonably careful handling this equipment will operate without trouble for many years.

In order to insure work of uniformly high quality, all welders should be required to submit welded test specimens at intervals. This will not only give a check on welders' ability but will make certain that they are able to pass the qualification tests that are now required on important welded piping installations.

Obtaining welding work is a matter which will become easier as successful welded heating systems can be shown to prospective customers. One contractor, who makes many welded installations every year, has a unique method of securing new work. When the lines are all welded and the radiators in place, the system is tested with steam at about twice normal working pressure in order to see if there are any leaks and to see whether the entire circuit from boiler to radiators and back is functioning properly. A few days previous to this time the welding and steam-fitting contractor sends out invitations to prominent contractors, engineers, architects, inspectors, building owners and other interested persons to view the lines while the test is in progress. As a result of the attendance at these tests this man does not have to solicit contracts or invitations to bid. The visitors are enthusiasts from the moment they see the welded line under pressure.

There are two methods of making a welded heating piping installation: The first method is to lay out beforehand a thorough plan of the job showing all details and measurements and then to cut, fit and weld together the parts in the shop in accordance with the blueprints. The parts are cut in the shop, and assembled into sections as large as it is possible to transport and get into the building. These sections are tested, and then carted to the building and put into place in hangers.

Next the welder comes and ties in the sections to one another. This makes a minimum number of welds to be made on the job, all these welds being, of course, position welds. By a position weld is meant that the pipe can not be turned as in making rolling welds. The overhead welding necessary in making a position butt weld in a horizontal line requires a certain degree of skill on the part of the welder and all pipe welders should thoroughly be trained in making these position welds. Some contractors claim that to have the welders make all position welds is a constant check on the ability of the workman: If he can make a position weld which will meet the test he can surely excel at making the easier type of rolling weld as made in the shop.

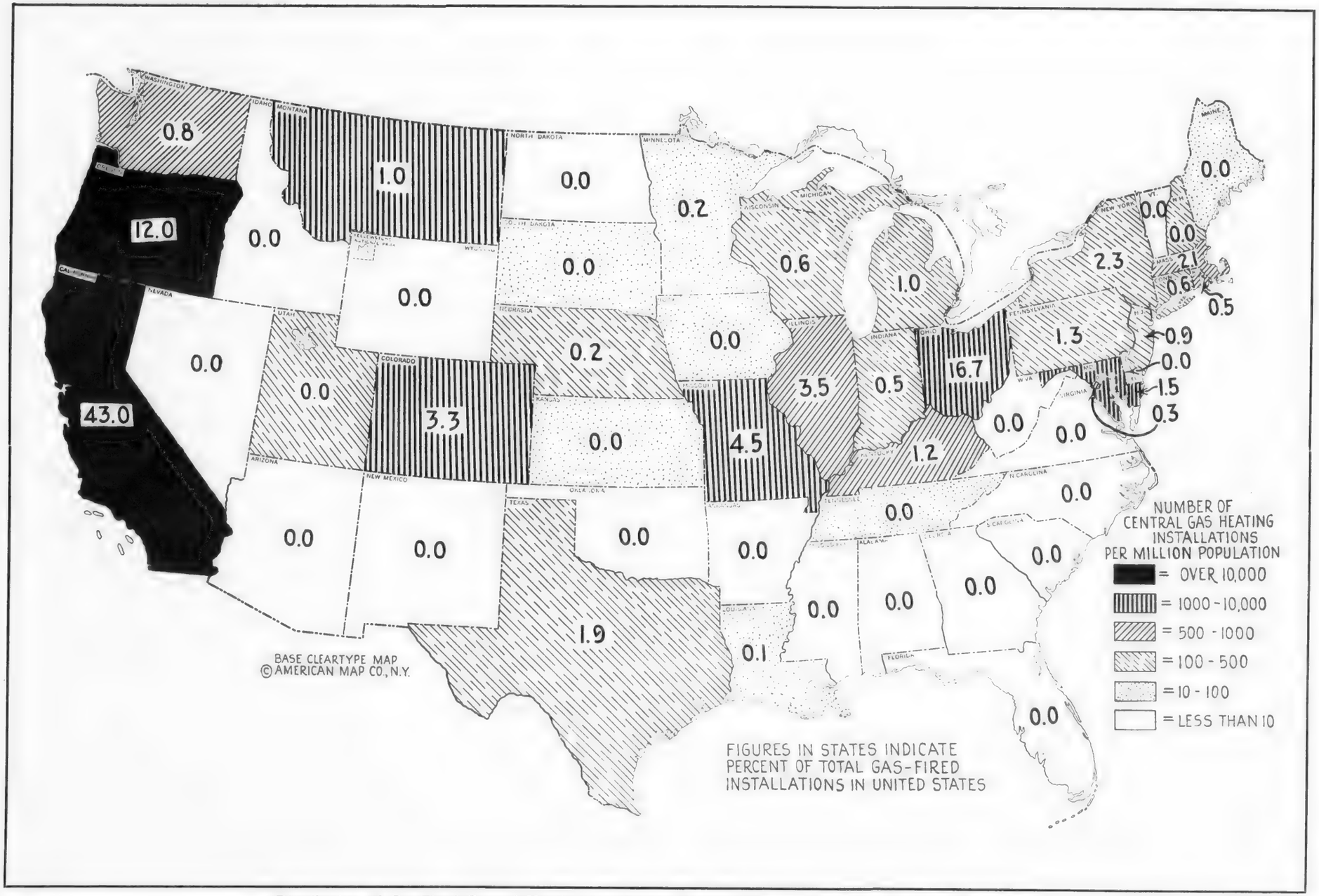
Special Welded Cross with Eccentric Reducer

This method of installation calls for paper work which some contractors look upon as unnecessary, especially if the installation is a small one and the cutting and fitting will not be any more expensive if performed right on the job, so they substitute for it the second method.

The second method is sometimes called the "cut-and-fit" method. The piping contractor makes a survey of the building and figures approximate amounts of the various sizes of pipe which will be needed for the work. This pipe is then shipped from the factory or shop in standard lengths to the building. When long sweep bends in large diameter pipe are installed they are made up beforehand from estimates furnished by the contractor. Installation of the various circuits of feed and return pipes starts at the boiler. The rolling welds are made on the floor, and the actual welding of the pipe sections so assembled is done in position. This work progresses to its final point at the radiators, all pipe being cut and welded on the job.

Heating an Elbow Before Bending

Bending a Small Riser with Oxy-Acetylene



Distribution of Gas-Fired Central Heating Installations Showing Percentages of Nation's Total by States

Gas House-Heating Shows Remarkable Increase

HOUSE-HEATING installations burning manufactured gas increased 20.5% for the season of 1928-29, as compared with the previous season. The number of natural gas installations increased 15.7% during the same period, making the total increase in gas heating 19.5%.

The above figures, compiled by the American Gas Association, are based on data supplied by companies which reported for both 1928 and 1929. Many utilities failed to answer the questionnaire in time to be included in the survey, so that the total number of installations as reported is less than the actual total. Consequently, the increases are conservative in every sense.

Prepared by HEATING AND VENTILATING, the accompanying map shows the distribution of gas-fired heating installations by states in percent of the nation's total. The shading on the map indicates the number of gas boilers, furnaces and conversions with respect to population.

With installations in California amounting to 43.0% of the country's total, and with 12.0% of the total in Oregon, the west coast contains over 55% of all gas-fired central heating installations. While over half the gas-fired systems reported from California burn natural gas, those in Oregon use manufactured fuel. Natural gas installations in California, together with those in Ohio, represent 86.1% of natural gas installations, which total 65,402. These figures, which show that 53.8% of the gas-fired heating installations in this country burn manufactured gas, constitute an effective counter argument against those who claim that gas heating is confined principally to installations burning natural gas.

Especially since this state uses manufactured gas, it is interesting to note that Oregon, with only 0.9% of the country's total population, contains 12.0% of the total gas-heating installations.

Gas-fired warm-air systems stead-

INSTALLATIONS OF GAS-FIRED CENTRAL HEATING SYSTEMS REPORTED FOR 1929

MANUFACTURED GAS

State	Total Installations	Straight Gas Designed Boilers	Straight Gas Designed Furnaces	Conversions Boilers	Conversions Furnaces
Arizona	3	1	2	0	0
California	28110	2394	25700	16	0
Colorado	4696	195	1105	913	2483
Connecticut	759	629	114	15	1
Dist. of Columbia	407	394	13	0	0
Georgia	1	1	0	0	0
Idaho	5	4	1	0	0
Illinois	4945	3706	1035	154	50
Indiana	722	316	366	18	22
Iowa	61	24	30	4	3
Kentucky	1660	360	1300	0	0
Louisiana	70	3	0	47	20
Maine	30	23	3	4	0
Maryland	1987	1796	86	94	11
Massachusetts	2936	2174	358	369	35
Michigan	1499	787	294	38	380
Minnesota	215	193	8	12	2
Mississippi	10	0	1	5	4
Missouri	1811	914	122	156	619
Montana	6	1	5	0	0
Nebraska	196	20	173	3	0
Nevada	5	1	4	0	0
New Hampshire	95	89	5	0	1
New Jersey	1301	1203	53	38	7
New York	3188	2362	476	273	77
North Carolina	4	4	0	0	0
Ohio	31	11	8	5	7
Oregon	16982	1883	15071	23	5
Pennsylvania	1801	1657	142	2	0
Rhode Island	692	602	78	11	1
South Dakota	21	10	9	2	0
Tennessee	61	32	3	14	12
Utah	59	12	35	2	10
Vermont	2	2	0	0	0
Virginia	14	13	0	1	0
Washington	1085				
West Virginia	12	4	1	6	1
Wisconsin	887	536	326	14	11
Wyoming	77	37	23	14	3

NATURAL GAS

State	Total Installations	Straight Gas Designed Boilers	Straight Gas Designed Furnaces	Conversions Boilers	Conversions Furnaces
California	32900	100	31600	900	300
Kansas	80	30	34	8	8
Louisiana	75	35	8	25	7
Maryland	133	11	11	98	13
Missouri	4521	94	358	800	3269
Montana	1415	34	125	366	890
Ohio	23539	4703	7850	2676	8310
Pennsylvania	1	1	0	0	0
Texas	2738	57	147	800	734

SUMMARY

	1929	1928
Total manufactured gas installations	76,369	63,388
Total natural gas installations	65,402	55,312
Total of all gas installations	141,771	118,700
Straight gas designed jobs		
Steam, hot water and vapor, manufactured gas	22,436	16,225
Steam, hot water and vapor, natural gas	5,065	4,539
Warm air, manufactured gas	47,930	20,031
Warm air, natural gas	40,133	38,046
Conversion installations		
Steam, hot water and vapor, manufactured gas	2,241	775
Steam, hot water and vapor, natural gas	5,673	4,265
Warm air, manufactured gas	3,759	657
Warm air, natural gas	14,531	8,462

ily are gaining ground. This is reflected in an increase of 51.5% in straight gas-designed warm-air installations for this year over last year, while straight gas designed steam, vapor and water installations increased 32.5%. Warm-air conversions showed an increase of 100%, while boiler conversions rose 52%.

The data indicate that gas conversion units are becoming more and more popular. At the A. G. A. convention in 1928, the opinion was expressed that gas conversions will prove to be important stepping stones in aiding the utilities in selling gas heat to the home-owner, thus making it easier to sell him straight gas-designed jobs in the future. This idea apparently is gaining favor. The number of gas conversions utilizing manufactured gas in boilers increased 189% for the year, while those in warm-air furnaces increased 472%.

Expressed in percentages, the increased use of gas conversion equipment in natural gas territory is not so large as the increase in manufactured gas territory. This is due to the fact that there has been for many years a large number of conversion installations in the natural gas territory, so that even a large increase in number represents but a small percentage increase.

Use of gas conversion equipment makes the collection of accurate data on the number of installations difficult. In the natural gas field there are said to be thousands of installations of such equipment made by the owner or some contractor of which the utility has no record.

So far as gas-fired central heating equipment is concerned, Missouri is an outstanding state. While the percentage of the nation's total is not high, this state is among the leaders in the number of jobs compared with the population. Missouri has 4.5% of the burners with only 2.94% of the population.

In HEATING AND VENTILATING for August, it was shown that so far as oil-burning units compared to population is concerned, Nebraska leads the country with 23,480 burners per million population. With gas equipment, Oregon easily leads with 18,800 units per million population.

With Oregon topping the list of gas-fired heating equipment per capita, and with Nebraska walking off with the honors in oil-burning equipment, the east with its large industrial and financial centers is lagging well behind in the adoption of automatic heat.

Many states on the map are listed at 0% for the country. This does not necessarily mean that there are no installations, but merely that, in many cases, the number in respect to the total is so small that it does not show up in the first decimal place.

Some of the striking increases in gas heating are shown in the following states:

The number of total installations in Colorado rose from 1537 to 4696, an increase of 206%; Michigan showed a gain from 565 to 1499, an increase of 165%; Massachusetts, which has 2936 installations this season, had 1796 reported last year, a gain of 63.5%. The state of Washington last year had 620 installations, as compared with 1085 this year, a 75% increase. New York gas companies gained 1256 house-heating customers, which, compared to 1932 reported last year, shows an increase of 39.4%. Missouri, with 1911 this year, and only 812 during 1927-8, shows an increase of 123%.

On the previous page are presented data which show the distribution by states for various types of installations in both manufactured and natural gas territories.

The Eastward Trend of Natural Gas

WITH new natural gas fields being discovered yearly, and large quantities of this gas being transported hundreds of miles to our great industrial centers, it seems possible that the present supply of gas might be changed even in such large centers of population as Chicago and New York. Many of the large middle-western cities are already being served with natural gas. Transmission mains of five hundred miles or more are becoming quite common and it is only logical to assume that, before long, practically every large industrial center in the West will be supplied, at least partially, with this kind of gas.

It also would seem logical to assume that, inasmuch as natural gas is a very satisfactory fuel and in view of the fact that it can be piped such great distances readily, it would not be long before we should expect the demise of many manufactured gas plants.

In the writer's opinion, however, this will never generally take place for three reasons: First, the fuel requirements of the country are increasing at such a rapid rate that the supply of natural gas will probably always prove inadequate; second, there will always be certain industries which produce as a byproduct a very satisfactory and usable gas; and third, it doubtless will be found economically impractical to pump and distribute such a high gravity gas beyond certain predetermined distances.

It is quite likely that many of the small and more or less obsolete manufactured gas plants will be abandoned. As a matter of fact, this is already taking place and is especially probable where such plants are located near large natural gas fields or larger and more efficient manufactured gas plants. A more likely development, however, is that the majority of modern manufactured gas plants will be remodeled to augment a supply of natural gas where available. Some of the probable uses for such plants will be cracking refinery oil gases and natural gas, and the production of low-gravity, low-heating-value manufactured gases high in free hydrogen content.

As the nature of our supply becomes more varied, its utilization will require a more flexible gas. Natural gas and manufactured gases of extremely high hydrocarbon content can be made much more flexible by adding free hydrogen. Hydrogen, fortunately, also compensates for inerts by increasing the rate of flame propagation and offsetting the increased primary air injection caused by a heavier mixture. Consequently, we may expect the production of large quantities of this gas in the future. It is now being made experimentally without the production of objectionable quantities of carbon by injecting mixtures of steam and natural gas through a heated bed of coke in the usual type of water gas set.

Theories governing the successful mixing of gases are the foundation of a rather complex art which the American Gas Association's Laboratory is endeavoring to simplify and coordinate in such a manner that they can readily be applied by any practical gas engineer. From present indications, many ideas now existing regarding the allowable percentage of inerts and minimum acceptable heating values are subject to revision.

(Continued on Page 81)

Degree-Days in One Thousand Cities

A MONUMENTAL undertaking has been completed by HEATING AND VENTILATING in the computation of the degree-days in nearly 1000 American cities. The complete list is here presented, arranged alphabetically by states.

In the previous compilation, which appeared in THE HEATING AND VENTILATING MAGAZINE for September, 1925, 327 cities were represented. With the data from more than three times that number, it has been possible to redraw Heating and Ventilating's Iso-Degree-Day Charts with much greater accuracy.

In many cases the new curves were found to follow a somewhat different course from those shown in the original charts. For that reason a new series of charts has been prepared and will appear in HEATING AND VENTILATING as Data Sheets, beginning with this issue.

To make the charts of the greatest usefulness, they will be presented by states.

As is well known, the expression "degree-day" represents the product of one day of time and one degree of temperature. It was originally devised by the American Gas Association. Based on a comprehensive study of actual conditions, the American Gas Association fixed a mean daily temperature of 65° F. as the boundary of the heating season, as this was found to be the average temperature below which, if the heating system is not controlled automatically, people demand heat. It will be realized that with a daily mean temperature of 65° F., the daytime temperature will average about 70° F., and the only time room temperatures would be below the comfort points would be around midnight. This explains the use of the arbitrary figure of 65° F. as a base temperature.

To show exactly how the degree-days were computed, we will take a typical city. In Detroit for instance, the computations were as follows:

DETROIT, MICH.

Month	Mean Temp. Below 65° F.	Days in Month	Degree-Days
January	40.4	31	1253
February	40.5	28	1134
March	31.4	31	976
April	19.1	30	573
May	7.3	31	226
June	—	30	—
July	—	31	—
August	—	31	—
September	1.4	30	42
October	12.9	31	400
November	25.9	30	777
December	35.9	31	1113
Total			6494

The degree-days given in the table, therefore, represent the relative heating loads in the cities named. The data are taken from recorded temperature observations covering from 10, 20 to 50 years, and include those of the past winter. In some cases they will be found to vary from the degree-days previously published for certain cities. Wherever that occurs, it may be attributed to the additional observations.

ALABAMA

No.		Degree-Days
1	Anniston	2813
2	Ashville	2881
3	Bermuda	1817
4	Birmingham	2408
5	Camp Hill	2251
6	Clanton	2408
7	Decatur	3126
8	Enfanla	2147
9	Hamilton	2764
10	Healing Springs	2257
11	Livingston	2371
12	Mobile	1471
13	Montgomery	1886
14	Ozark	1735
15	Riverton	3396
16	Scottsboro	3153
17	Tuscaloosa	2529
18	Valley Head	3218

ARIZONA

19	Alpine Ranger Sta.	7863
20	Casa Grande	1283
21	Chin Lee	5908
22	Clifton	2182
23	Congress	1688
24	Douglass	2628
25	Flagstaff	7145
26	Fort Apache	4925
27	Granite Reef Dam	1418
28	Kayenta	5317
29	Leupp	5311
30	Miami	2418
31	Moccasin	5324
32	Nogales	2513
33	Parker	1498
34	Payson	4496
35	Pinto	5422
36	Prescott Dry Farm	4499
37	Salome	2144
38	San Carlos	2258
39	Seligman	5004
40	Sentinel	1154
41	Supai	2722
42	Tucson	1845
43	Truxton	3375
44	Yuma	918
45	Willcox	3325

ARKANSAS

46	Arkadelphia	2511
47	Batesville	3430
48	Bentonville	3949
49	Bergman	3956
50	Corning	3681
51	Dardanelle	3012
52	Dumas	2308
53	Dutton	4167
54	El Dorado	2301
55	Fort Smith	3214
56	Helena	2764
57	Little Rock	2811
58	Mammoth Springs	3735
59	Mena	3006
60	Mountain Home	3538
61	Okay	3440
62	Osceola	3152
63	Portland	2183
64	Stuttgart	2776
65	Texarkana	2216
66	Wynne	3070

CALIFORNIA

67	Alturas	6671
68	Bagdad	1142
69	Bakersfield	2047
70	Barstow	2299
71	Bishop	4415
72	Blythe	1741
73	Branscomb	4213
74	Burney	6165
75	Calmilla	4869
76	Calexico	1090
77	China Flat	3524
78	Cloverdale	2703
79	Crescent City	4712
80	Cuyamanca	5245
81	Davis	2901
82	Delta	3112
83	Downieville	4574
84	Emigrant Gap	5617
85	Fort Bidwell	6680
86	Georgetown	3736
87	Grass Valley	3755
88	Greenland Ranch	1089
89	Healdsburg	2714
90	Hollister	2652
91	King City	2405
92	Lick Observatory	4971
93	Livermore	2489
94	Lone Pine	3804
95	Los Angeles	1504
96	Macdoel	7782
97	Madeline	7926
98	Marysville	2499
99	McCloud	6053
100	Mecca	1176
101	Merced	2473
102	Mojave	2463
103	Montague	5123
104	Mt. Tamalpais	3868
105	Needles	1293
106	Oceanside	1821
107	Oroville	2514
108	Placerville	3958
109	Quincy	5574
110	Red Bluff	2512
111	Sacramento	2654
112	Santa Barbara	1996
113	San Bernardino	1830
114	Santa Clara	3175
115	Santa Cruz	2811
116	San Diego	1645
117	San Francisco	3264
118	St. Helena	2869
119	San Luis Obispo	2353
120	Sterling	852
121	Storey	2944
122	Susanville	6138
123	Tulare	2299
124	Upper Lake	2865
125	Weaverville	4663
126	West Branch	5032
127	Willows	2655
128	Yosemite	5341

COLORADO

129	Akron	6723
130	Arriba	6393
131	Blue Valley Ranch	9759
132	Boulder	5523
133	Buena Vista	8849
134	Burlington	5903
135	Cheesman	6907
136	Cheyenne Wells	6336
137	Colorado Springs	6553
138	Delta	6065
139	Denver	5873
140	Dillon	11516
141	Dolores	6824
142	Fort Lewis	7645
143	Fraser	12022
144	Fruita	6205
145	Garnett	8633
146	Grover	7641
147	Gunnison	10224
148	Hamps	6969
149	Holly	5169
150	Huerfano	6157
151	Husted	6741
152	Julesburg	6752
153	Lake City	9331
154	Las Animas	5598
155	Lay	8337
156	Manassa	8295
157	Nast	10481
158	Pagosa Springs	8532
159	Pueblo	5514
160	Rangely	7888
161	Redvale	7057
162	Rifle	6643
163	Salida	7166
164	San Luis	8227
165	Steamboat Springs	9628
166	Two Buttes	5163
167	Trinidad	5328
168	Wagon Wheel Gap	10834
169	Walden	9918
170	Westcliffe	8170
171	Wray	5673

CONNECTICUT

172	Cream Hill	7137
173	Hartford	6037
174	New Haven	5895
175	North Grosvenor Dale	6799

DELAWARE

176	Delaware City	4911
177	Dover	4590
178	Milford	4301
179	Millsboro	4527
180	Seaford	4553
181	Wilmington	4788

DISTRICT OF COLUMBIA

182	Washington	4626

FLORIDA

183	Cedar Keys	641
184	Fort Myers	122
185	Jacksonville	890
186	Monticello	1129
187	Okeechobee	91
188	Pensacola	1448
189	Tampa	296
190	Titusville	345

GEORGIA

191	Albany	1648
192	Americus	1894
193	Athens	2955
194	Atlanta	2891

195 Augusta 2161
196 Bainbridge 1473
197 Brunswick 1269
198 Carrollton 2807
199 Columbus 2043
200 Concord 2597
201 Clayton 3613
202 Covington 2785
203 Diamond 3657
204 Elberton 2728
205 Fitzgerald 1657
206 Fort Gaines 1807
207 Gainesville 3213
208 Gillsville 2806
209 Glenville 1623
210 Harrison 2183
211 Macon 2203
212 Marshallville 2016
213 Millen 1967
214 Ramhurst 3216
215 Rome 3067
216 St. George 1198
217 St. Mary's 1187
218 Savannah 1490
219 Talbotton 2257
220 Thomasville 1400
221 Waycross 1470
222 Washington 2653
223 West Point 2658
224 Valdosta 1308
225 Valona 1485

IDAHO

226 Ashton 8037
227 Avery 6946
228 Boise 4558
229 Glenns Ferry 5683
230 Grace 7650
231 Kooskia 5939
232 Mackay 8579
233 New Meadows 8524
234 Oakley 6458
235 Salmon 7969
236 Sandpoint 7327
237 Springfield 7477

ILLINOIS

238 Antioch 6587
239 Bloomington 5793
240 Cairo 3911
241 Chicago 6315
242 Griggsville 5272
243 Harrisburg 4438
244 Havana 5364
245 Henry 5712
246 Hillsboro 5009
247 Joliet 6535
248 La Harpe 5913
249 Mt. Carmel 4697
250 Mt. Vernon 4630
251 Palestine 5015
252 Pontiac 5696
253 Rockford 6847
254 Springfield 5370
255 Urbana 5805

INDIANA

256 Anderson 5435
257 Auburn 6421
258 Bedford 4682
259 Bloomington 4769
260 Bluffton 5865
261 Crawfordsville 5334
262 Evansville 4164
263 Fort Wayne 5916
264 Greensburg 5273
265 Huntingsburg 4371
266 Indianapolis 5297
267 Jeffersonville 4326
268 Kokomo 5592
269 Lafayette 5932
270 Madison 4473
271 Plymouth 6148
272 Richmond 5775
273 Rome 4008
274 South Bend 6076
275 Terre Haute 4871
276 [illegible] 6349
277 Washington 4639

IOWA

278 Algona 7421
279 Bonaparte 6159
280 Clarinda 6285
281 Corydon 6262
282 Cresco 8517
283 Davenport 6287
284 Denison 6803
285 Des Moines 6373
286 Dubuque 6788
287 Gutline Center 6573
288 Independence 7075
289 Marshalltown 7094
290 Mason City 7571
291 Rockwell City 8003
292 Sibley 7917
293 Sioux City 7023
294 Washington 6322
295 Webster City 6781

KANSAS

296 Burr Oak 5377
297 Colby 5638
298 Dodge City 5034
299 Emporia 4792
300 Fort Scott 4379
301 Hanover 3044
302 Hays 5268
303 Healy 5371
304 Hutchinson 4679
305 Independence 4024
306 Medicine Lodge 4238
307 Phillipsburg 5407
308 Salina 4969
309 Topeka 5301
310 Toronto 4581
311 Ulysses 5008
312 Wichita 4877

KENTUCKY

313 Alpha 3540
314 Bardstown 4079
315 Bowling Green 3855
316 Catlettsburg 4279
317 Farmers 4500
318 Frankfort 4110
319 Franklin 3569
320 Greensburg 4369
321 Junction 4113
322 Lexington 4616
323 Louisville 4180
324 Marion 3933
325 Middlesboro 3857
326 Owensboro 4176
327 Paducah 3939
328 Richmond 4126
329 Scott 4785

LOUISIANA

330 Alexandria 1747
331 Amite 1494
332 Antioch 2157
333 Baton Rouge 1349
334 Calhoun 2169
335 Cameron 1285
336 Cheneyville 1606
337 Collinston 1997
338 Dodson 1726
339 Franklin 1188
340 Franklinton 1489
341 Grand Cane 2099
342 Houma 1078
343 Lake Charles 1396
344 Melville 1431
345 Natchez 1668
346 New Orleans 1023
347 Rayne 1267
348 Robeline 1996
349 Shreveport 1938
350 Tallulah 2057
351 Tenmile 1454
352 Vicksburg 1809

MAINE

353 Bar Harbor 7643
354 Eastport 8531
355 Greenville 9533
356 North Brighton 7600
357 Orono 7837
358 Portland 7012
359 Presque Isle 9440

MARYLAND

360 Annapolis 4284
361 Baltimore 4333
362 Cambridge 4245
363 Clear Spring 5520
364 Cumberland 5195
365 Emmitsburg 5331
366 Fallston 5260
367 Frederick 5928
368 Grantsville 6442
369 Princess Anne 3894
370 Solomon 4214
371 Sudlersville 4762
372 Takoma 4997

MASSACHUSETTS

373 Amherst 6958
374 Boston 6145
375 Fitchburg 6732
376 Nautucket 6059
377 Williamstown 7221

MICHIGAN

378 Ann Arbor 6865
379 Battle Creek 6583
380 Cadillac 7967
381 Calumet 9295
382 Charlevoix 7581
383 Cheboyan 8293
384 Coldwater 6420
385 Detroit 6494
386 Flint 7179
387 Grand Rapids 6534
388 Harrison 7747
389 Hart 7038
390 Iron River 9416
391 Ironwood 9126
392 Kalamazoo 6652
393 Lansing 7112
394 Marquette 8692
395 Menominee 8033
396 Mio 8330
397 Pontiac 6921
398 Port Austin 7362
399 Saginaw 7061
400 St. Joseph 6202
401 Sault Ste. Marie 9281
402 Seney 9294

MINNESOTA

403 Beardsley 8491
404 Cass Lake 9292
405 Duluth 9480
406 Fairmont 8448
407 Hallock 10285
408 International Falls 10181
409 Luverne 7915
410 Minneapolis 7851
411 Montevideo 8168
412 Moorhead 9315
413 Red Wing 7886
414 Rochester 8123
415 St. Paul 7925
416 Sandy Lake Dam 9620
417 Thief River Falls 10054
418 Tower 10438
419 Wadena 9621

MISSISSIPPI

420 Austin 2753
421 Batesville 2904
422 Columbia 1740
423 Corinth 3411
424 Crystal Springs 2010
425 Greenwood 2390
426 Holly Springs 3308
427 Koscinsko 2480
428 Leakville 1302
429 Macon 2507
430 Nitta Yuma 2649
431 Palo Alto 2524
432 Pearlington 1331
433 Pecan 1365
434 Porterville 2104
435 Rosedale 2344
436 Shoccoe 1932
437 Shubuta 2133
438 Tupelo 2780
439 Woodville 1565
440 Vicksburg 1822
441 Yazoo City 2152

MISSOURI

442 Bolivar 4327
443 Caruthersville 3429
444 Chillicothe 4900
445 Dean 3942
446 Glasgow 5234
447 Grant City 5659
448 Hannibal 5245
449 Hollister 3750
450 Jackson 4229
451 Jefferson City 4874
452 Kansas City 5202
453 New Haven 4542
454 Poplar Bluff 3910
455 Potosi 5287
456 St. Joseph 5142
457 St. Louis 4585
458 Unionville 5930
459 Warsaw 4449
460 Willow Springs 4303

MONTANA

461 Biddle 7783
462 Billings 7115
463 Browning 9396
464 Butte 8271
465 Columbia Falls 8077
466 Dillon 7794
467 Glendine 8236
468 Great Falls 7233
469 Harlowton 9377
470 Havre 8699
471 Hebgen Dam 10944
472 Helena 8054
473 Lewiston 8230
474 Livingston 7200
475 Malta 8912
476 Miles City 7719
477 Ovando 9145
478 Poplar 9241
479 Roundup 7492
480 Thompson Falls 7345
481 Upper Yaak River 9207
482 Victor 7636

NEBRASKA

483 Bridgeport 6829
484 Culbertson 5607
485 Dumas 7203
486 Fort Robinson 7093
487 Halsey 6646
488 Hebron 5952
489 Hillside 6830
490 Kearney 6048
491 Kennedy 6921
492 Kimball 6721
493 Madrid 6454
494 Omaha 6128
495 St. Paul 5954
496 Santee 6864
497 Springview 6869
498 Stanton 6797
499 Tecumseh 5771

NEVADA

500 Belmont 7405
501 Beowawe 6617
502 Los Vegas 2849
503 McGill 6978
504 Quinn River 6670
505 Reno 5891
506 Wells 7576

NEW HAMPSHIRE

507 Bethlehem 8672
508 Concord 6852
509 Hanover 8063
510 Keene 7457

NEW JERSEY

511 Asbury Park 5273
512 Atlantic City 5175
513 Belvidere 5788
514 Bergen Point 5358
515 Bridgeton 4651
516 Burlington 4998
517 Cape May City 4981
518 Clayton 5045
519 Dover 5970
520 Elizabeth 5302
521 Hightstown 5359
522 Indian Mills 5170
523 Jersey City 5192
524 Lakewood 5400
525 Lambertville 5318
526 Long Branch 5395
527 Newark 5387
528 Newton 6132
529 New Brunswick 5405
530 Paterson 5369
531 Plainfield 5538
532 Sandy Hook 5441
533 Somerville 5586
534 South Orange 5746
535 Sussex 6134
536 Trenton 4934
537 Woodbine 5037

NEW MEXICO

538 Albuquerque 4303
539 Aragon 6160
540 Campana 4282
541 Carlsbad 2589
542 Chama 7945
543 Clayton 4831
544 Clovis 4195
545 Corona 5113
546 Elephant Butte 3400
547 Elizabethtown 9455
548 Fort Stanton 5066
549 Fort Sumner 3913
550 Fort Wingate 5640
551 Fort Union 6229
552 Fruitland 5537
553 Gage 3251
554 Gallinas Springs 4552
555 Magdalena 4938
556 Raton 5947
557 Sante Fe 6063
558 Senorito 8930

NEW YORK

559 Albany 6889
560 Appleton 6780
561 Binghamton 6801
562 Buffalo 6821
563 Cape Vincent 7774
564 Cooperstown 7756
565 Cutchogue 5623
566 De Ruyter 7688
567 Elmira 6414
568 Franklinville 7454
569 Glens Falls 7143
570 Gloversville 7468
571 Indian Lake 8775
572 Ithaca 6719
573 Liberty 7477
574 Little Falls 7602
575 Lyons 6446
576 Middlebury 6800
577 Moira 8149
578 Mohonk Lake 6963
579 New York City 5348
580 North Lake 8364
581 Number Four 8715
582 Ogdensburg 7490
583 Oswego 7087
584 Plattsburg 7894
585 Port Jervis 6388
586 Rochester 6733
587 Rome 7421
588 Saranac Lake 8673
589 Setauket 5554
590 South Canisteo 7197
591 Syracuse 6592
592 Ticonderoga 7319
593 Watertown 7298
594 Westfield 6547
595 West Point 5884

NORTH CAROLINA

596 Andrews 3902
597 Asheville 4263
598 Banners Elk 5747
599 Beaufort 2308
600 Brevard 4180
601 Brewers 3910
602 Eagletown 3347
603 Greensboro 3527
604 Hatteras 2571
605 Hickory 3111
606 Hot Springs 3487
607 Kinston 2767
608 Louisburg 3516
609 Marion 3597
610 Monroe 3152
611 Mt. Airy 4128
612 Nashville 3219
613 Pinehurst 2818
614 Pittsboro 3618
615 Raleigh 3234
616 Roxboro 3836
617 Salisbury 3221
618 Southport 2199
619 Washington 2672
620 Wilmington 2302

NORTH DAKOTA

621 Mayville 9250

622	Manfred	9746
623	Jamestown	9405
624	Hannah	10714
625	Grafton	9171
626	Forman	8898
627	Ashley	9469
628	Crosby	10087
629	Donnybrook	10002
630	Fort Yates	8520
631	New England	8971
632	Oakdale	8719
633	Washburn	9030
634	Westhope	10633

OHIO

635	Akron	6069
636	Bangorville	5918
637	Bellefontaine	6044
638	Bowling Green	6230
639	Cambridge	5486
640	Canton	6002
641	Cardington	5985
642	Cincinnati	4702
643	Clarington	5037
644	Clarksville	5233
645	C'eveland	6154
646	Columbus	5323
647	Dayton	5274
648	Dover	6005
649	Green	4644
650	Greenville	5627
651	Hillhouse	6521
652	Kenton	5693
653	Lancaster	5324
654	Lima	5931
655	Marietta	4758
656	Millport	6314
657	Montpelier	6410
658	New Bremen	5765
659	North Lewisburg	5803
660	Oberlin	6171
661	Orangeville	6464
662	Peebles	4521
663	Plattsburg	5690
664	Pomeroy	4827
665	Portsmouth	4412
666	Sandusky	6203
667	Shenandoah	6643
668	Somerset	5315
669	Toledo	6103
670	Upper Sandusky	5804
671	Waverly	4744

OKLAHOMA

672	Chattanooga	2962
673	Enid	3851
674	Hugo	2648
675	Kenton	4449
676	Keokuk Falls	3611
677	Newkirk	3731
678	Oklahoma City	3613
679	Rankin	3851
680	Ravia	2739
681	Tulsa	3560
682	Vinita	3682
683	Woodward	4008

OREGON

684	Baker	7166
685	Falls City	5367
686	Dayville	5510
687	Diamond	7307
688	Klamath Falls	6461
689	Lakeview	7094
690	McKenzie Bridge	5703
691	Parkdale	6555
692	Portland	4468
693	Roseburg	4627
694	Silver Lake	7423
695	Umatilla	4886
696	Vale	6264
697	Waldo	5645
698	Wallowa	7360
699	Warmspring	5687

PENNSYLVANIA

700	Altoona	6133
701	Bethlehem	4232
702	Emporium	6465
703	Erie	5866
704	Gettysburg	5580
705	Gordon	6374
706	Grove City	6189
707	Harrisburg	5476
708	Hyndman	5547
709	Lebanon	5586
710	Lewisburg	6395
711	Philadelphia	4855
712	Pittsburgh	5235
713	Reading	5388
714	Scranton	6129
715	Towanda	6540
716	Uniontown	5278
717	Warren	6584
718	Wellsboro	6892
719	Williamsport	5450

RHODE ISLAND

720	Block Island	5485
721	Providence	6014

SOUTH CAROLINA

722	Aiken	2311
723	Allendale	2156
724	Anderson	2732
725	Charleston	1769
726	Cheraw	2816
727	Columbia	2364
728	Dillon	2500
729	Ferguson	2245
730	Georgetown	2027
731	Greenville	3452
732	Health Spring	2963
733	Newberry	2649
734	Paris Island	1601
735	Spartanburg	3257
736	Walhalla	3191
737	York	2725

SOUTH DAKOTA

738	Academy	7044
739	Dowling	7338
740	Faulkton	8259
741	Flandrean	8026
742	Forestburg	7887
743	Jefferson	8419
744	Milbank	8466
745	Murdo	7138
746	Oelrichs	7271
747	Pollock	8779
748	Spearfish	7071
749	Yankton	7144

TENNESSEE

750	Carthage	3648
751	Chattanooga	3118
752	Knoxville	3670
753	Memphis	2950
754	Nashville	3578
755	Rogersville	4051
756	Savannah	3199
757	Springville	3653
758	Tullahoma	3794

TEXAS

759	Barstow	2224
760	Big Spring	2318
761	Blanco	1989
762	Bowie	2400
763	Brazoria	1010
764	Brownfield	3181
765	Childress	3046
766	Clarendon	3463
767	Claytonville	2533
768	Corpus Christi	723
769	Dalhart	4881
770	Denison	2505
771	Eagle Pass	871
772	El Paso	2428
773	Fort Clark	1374
774	Fort Davis	2647
775	Fort Lancaster	2030
776	Fort McIntosh	730
777	Fort Worth	2148
778	Galveston	1016
779	Haskall	2551
780	Hereford	4186
781	Houston	1157
782	Knickerbocker	1959
783	Lampasas	1974
784	Liberty	1101
785	Lieb	4433
786	Marshall	1923
787	Midland	2694
788	02 Ranch	2190
789	Panter	2069
790	Plainview	3332
791	Port Arthur	1271
792	Sierra Blanca	2128
793	Rock Island	1328
794	San Antonio	1202
795	San Augustine	1758
796	Somerville	1460
797	Sonora	2091
798	Spur	3196

UTAH

799	Black Rock	6432
800	Blanding	5867
801	Cedar City	5679
802	East Portal	11128
803	Emery	7020
804	Escalante	6193
805	Green River	5967
806	Ibopah	7569
807	Kelton	6690
808	Levan	6886
809	Logan	6735
810	Manila	8452
811	St. George	3758
812	Salt Lake City	5553

VERMONT

813	Burlington	7620
814	Enosbury Falls	8387
815	Northfield	8420
816	Wells	7937

VIRGINIA

817	Alexandria	4573
818	Big Stone Gap	4806
819	Culpeper	4666
820	Fredericksburg	4243
821	Ivanhoe	5096
822	Lynchburg	4019
823	Newport News	3481
824	Norfolk	3349
825	Roanoke	4068
826	Richmond	3725
827	Saxe	3905
828	Staunton	4445
829	Warsaw	4308
830	Williamsburg	3673
831	Winchester	4782
832	Woodstock	4804

WASHINGTON

833	Aberdeen	5518
834	Blaine	6120
835	Brewster	6392
836	Buckley	5573
837	Clearwater	5698
838	Colfax	6380
839	Cusick	7324
840	Davis Ranch	6342
841	Ephrata	4552
842	Glacier	7049
843	Kiona	4972
844	Lake Kachess	7690
845	Longmires Springs	7650
846	Lyle	5375
847	North Head	5452
848	Northport	7170
849	Oroville	6224
850	Port Angeles	6709
851	Port Townsend	5513
852	Seattle	4868
853	Sedro Woolley	5402
854	Sixprong	5083
855	Spokane	6353
856	Stehekin	6681
857	Tacoma	5180
858	Union City	5312
859	Vancouver	4748
860	Walla Walla	4809
861	Wenatchee	6658
862	Yakima	5690
863	Zindel	4311

WEST VIRGINIA

864	Bayard	6487
865	Cairo	4738
866	Charleston	3786
867	Elkhorn	4411
868	Elkins	5697
869	Green Sulphur Springs	5085
870	Huntington	4734
871	Lost Creek	5184
872	Marlinton	6370
873	Morgantown	5016
874	New Cumberland	5662
875	New Martinsville	4778
876	Point Pleasant	4517
877	Sutton	4303
878	Upper Tract	5036
879	Wheeling	5249
880	White Sulphur Springs	5341
881	Williamson	4243

WISCONSIN

882	Beloit	6879
883	Crandon	8975
884	Darlington	7420
885	Deerskin Dam	9786
886	Downing	8643
887	Eau Claire	7971
888	Florence	9112
889	Fond du Lac	7612
890	Green Bay	7823
891	Iron River	9202
892	Kewaunee	7947
893	La Crosse	6690
894	Madison	7395
895	Medford	8562
896	Milwaukee	7372
897	Oshkosh	7506
898	Park Falls	9118
899	Racine	6761
900	Reedsburg	7278
901	Rest Lake	9419
902	Sheboygan	7388
903	Spooner	8757
904	Sturgeon Bay	8193
905	Superior	9750
906	Tomahawk	8658
907	Valley Junction	7919
908	Waupaca	8493
909	Whitehall	7850
910	Wisconsin Rapids	8026

WYOMING

911	Casper	6979
912	Cheyenne	7462
913	Cody	7767
914	Cokeville	10519
915	Colony	7784
916	Daniel	11118
917	Dome Lake	11612
918	Ervay	8594
919	Gillette	7516
920	Green River	7199
921	Griggs	7519
922	Kinnear	8113
923	Newcastle	7428
924	Pathfinder	7398
925	Saratoga	8630
926	Snake River	10956
927	South Pass City	11110
928	Worland	8058
929	Yellowstone Park	9546

The Eastward Trend of Natural Gas

(Continued from Page 78)

It is a fact that under certain conditions, at least, rather large percentages of inerts are advantageous. Low-heating-value gases, if composed of the proper constituents, often make a very satisfactory fuel. Industrial applications appear to be subject to the greatest restrictions.

In the light of what has been said, it appears probable that most city gases of the future will be a mixture of many different kinds of commercial gases of which some type of natural gas will doubtless form a high percentage of the base load.

While the encouragement of water heating, refrigeration, house cooling, and certain kinds of industrial applications will improve our load curves, it is too much to expect that we will ever entirely eliminate our winter months' peak. This statement is best borne out by the progress which house heating is making all over the country. Consequently, a base load of natural and/or some manufactured gas will doubtless have to be augmented by blue gas, carburetted water, refinery oil, or cracked natural gas. Such practices will result in changes in specific gravity, heating value and, what is more important, chemical composition. Under these conditions, the association's mixed gas research findings should prove exceedingly valuable.

The abundant supplies of natural gas, which are being made available so rapidly to large centers of population, indicate that the day is not far distant when this kind of gas augmented by some satisfactory type of manufactured gas eventually should become the generally accepted fuel where available. These developments, along with the large quantities of by-product gases that are being made available, should greatly improve the economic position of our industry. —R. M. Conner, in the *A. G. A. Monthly* for September, 1929.

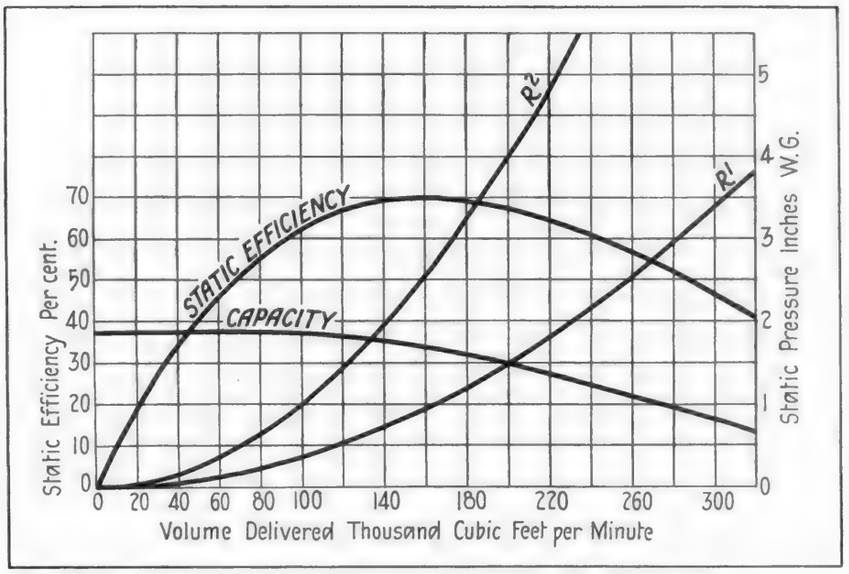

R2
R1
STATIC EFFICIENCY
CAPACITY
Static Efficiency Per cent.
Static Pressure Inches W.G.
Volume Delivered Thousand Cubic Feet per Minute
0 20 40 60 80 100 140 180 220 260 300
0 10 20 30 40 50 60 70
0 1 2 3 4 5

Fig. 1. How Fan Capacity and Efficiency Vary with Pressure and Volume

Elementary Fan Engineering

Part II

by **CHARLES A. CARPENTER**

Carpenter & Byrne, Pittsburgh, Pa.

IT IS generally considered that pressure losses through ducts, stokers, etc., vary as the square of the velocity. Therefore, within economical limits, velocities of air flow should be low. There is a definite relation between velocity in feet per minute and water gauge at 70° F. and 29.92 in. Hg expressed by the formula $V = 4005 \sqrt{P}$. For other temperatures, barometers or specific densities, by correcting the pressure P to its equivalent dry air pressure at 70° and 29.92 in. the true velocity "V" may be calculated.

We, therefore, can express the equivalent velocity - pressure formulae for total, static and velocity pressures thus, $V_t = 4005 \sqrt{P_t}$ $V_s = 4005 \sqrt{P_s}$ $V_v = 4005 \sqrt{P_v}$.

It is important to consider these three formulae if a correct solution of a fan problem is to be effected. After due allowance for the relative cost of duct work, air courses or other airway features, the static pressure becomes fixed by the requirements. The velocity necessary to keep the requisite amount of air flowing from the system also is fixed by the requirements.

The sum of the residual velocity pressure and the static pressure theoretically should equal the total pressure, but this is rarely the case in actual practice. This is due to the fact that the fan outlet and inlet dimensions are fixed. Consequently, a blowing fan rarely will deliver the required volume at the exact velocity required by the airway.

If proper attention be given this feature of a suitable gradually-flared connection between fan and airway, much of the usually-encountered excess velocity pressure may be converted to static pressure and the total pressure at the fan outlet will conform closely to the total pressure required by the job. If the connection between the fan and airway is poorly laid out, a considerable part of the excess velocity head will be lost in eddy currents, with consequent increase in required power consumption. A study of fan dimensions for each job is worth while.

It is needless to say that it is difficult to make a truly good job if the fan outlet be larger than the airway, necessitating an increase in velocity at the expense of fan static pressure.

For any given fan design that has been standardized it is apparent that

$$\frac{P_s}{P_t} \text{ or } \frac{\text{static pressure}}{\text{total pressure}}$$

has a definite value for total shut-off (unity), 25% of full open, free air discharge (zero), etc.

Example of Fan Selection

In most cases fan users have pretty definite ideas as to the volume of air required. It is more difficult to estimate the required pressure. If possible, the probable maximum and minimum pressures for the chosen volume should be estimated. In a given airway the pressure varies as the square of the volume flowing or $(\text{Capacity})^2 = \text{Pressure} \times \text{Constant}$. The constant, of course, depends upon the air course. This equation represents a parabola fixing the relative resistance encountered by a variable flow of air.

The following example is taken from an article published by the author in *The Mining Congress Journal* for November, 1928:

"Calculations or careful tests indicate that a certain mine requires 200,000 C.F.M. at minimum water gauge of 1½ in. static pressure when measured at the fan and when corrected to normal air standards. From a careful study, the maximum probable water-gauge for 200,000 C.F.M. has been found to be 4 in.

The pressure volume parabolas for the extreme conditions may be tabulated as follows and plotted as shown in Fig. 1.

Minimum R_1	
C.F.M.	Water Gauge
0	0
25,000	.023
50,000	.094
100,000	.375
150,000	.844
200,000	1.500
250,000	2.344
300,000	3.375

Maximum R_2	
C.F.M.	Water Gauge
0	0
25,000	.0625
50,000	.25
100,000	1.00
150,000	2.25
200,000	4.00
250,000	6.25
300,000	9.00

These curves are designated as R_1 and R_2 on the diagram.

Capacity and efficiency curves are indicated on the same diagram for a proposed fan running at some normal R.P.M. The intersection of the capacity curve with curve R_1 indicates that this fan at its given speed will deliver 200,000 C.F.M. at 1½ in. static pressure at 67.5% static efficiency.

If the resistance is as given by curve R_2, the fan capacity at normal speed falls to 133,000 C.F.M., at which point the efficiency would be 68.5% and the water gauge 1.78 in.

In order to force 200,000 C.F.M. through the mine, the fan speed must be increased approximately 50%, the efficiency will remain approximately 68.5% and the water gauge rises to 4 in.

The conditions assumed are quite extreme unless a considerable time is surveyed. In other words, the problem readily might cover the pressure-volume variation for the life of the fan.

The swings in mine resistance for the hourly or daily changes in the mine would be very much less and the variation in volume of air delivered by a proper fan would be so small that the usual constant-speed operation would be satisfactory. Of course, the speed would require adjustment from time to time as mine resistance increased, as often as the volume fell below some minimum, possibly some such quantity as 180,000 C.F.M.

At the normal R.P.M., when the fan is installed 180,000 C.F.M. can be delivered at 1.6 in. water gauge with an efficiency of 69.4%. This corresponds to a water gauge of 1.97 in. for 200,000 C.F.M. or 31% greater than the 1½ in. estimated for the installation.

Of course it follows that proper study enables the buyer to select a fan that best meets the probable changes in his mine. Such a study justifies a considerable reduction in that large annual fixed charge item —depreciation and obsolescence— and further insures a great saving in power cost."

Is the Apartment Replacing the Small Home?

A STEADY trend away from one and two-family homes toward apartment dwellings, not only in the larger cities of the country but in communities as small as those having 25,000 population, is reported by the United States Department of Labor. The inquiry has been raised in more than one quarter whether the single-family dwelling is soon to be nothing more than a memory in America.

In Milwaukee, figures compiled by Leon M. Gurda, city building inspector, covering the ten-year period from 1919 to 1928, inclusive, show that the percentage of Milwaukee families housed in apartments jumped from 23.20% in 1919, to 58.88% in 1928, and that in the same period the percentage of families housed in one and two-family homes decreased from 66.85% to 41.12%.

An interesting point brought out by Mr. Gurda is the fact that, in 1928 the cost of single-family dwellings increased $1,352 over the cost of these dwellings in 1927. The cost of two-family dwellings increased on the average $670. Mr. Gurda draws the deduction that the more the cost of one and two-family dwellings increases, and the more difficult and cumbersome the access to the commercial districts becomes, the greater will be the number of persons who will move into apartment buildings located near these centers.

In New York City, as already noted in these columns, there has been a steady trend toward the erection of apartment buildings in the older business sections in the lower part of the city.

Office Heating By Low-Temperature Electric Heaters

IN order to encourage the use in business offices in London of low-temperature electric heaters, which are claimed to be more economical, as well as more thorough than radiant heat systems, the City of London Electric Lighting Company is now supplying current for the purpose at the reduced rate of ½d. (one cent) per unit from 7 P.M. to 10 A.M., and at ¾d. (1½ cents) per unit for the rest of the day.

Low-temperatures, the company states, secure better results than the radiant type of promoting a constant, though gentle, circulation of air. No part of the convector is allowed to reach a temperature of more than 200° F., and the warmed air discharged into the room is never above 95° F.

The electrical loading of these convectors necessary to maintain an internal temperature of 60° F. has been found to be less than one-half that required by luminous radiators in securing the same result. The cost is said to be so small that a convector may be allowed to work all night and so reduce the cost of daytime heating.

A room of 1500 cu. ft. can be kept warm between 7 P.M. and 10 A.M. at a cost of 3¾d. (7½ cents), and investigations show that by this method the cost of heating can be kept between £2 10s. and £3 ($12.50 and $15) per annum per 1000 cu. ft. of room contents.

Entrance to Oakland-Alameda Estuary, Showing Ventilating Building

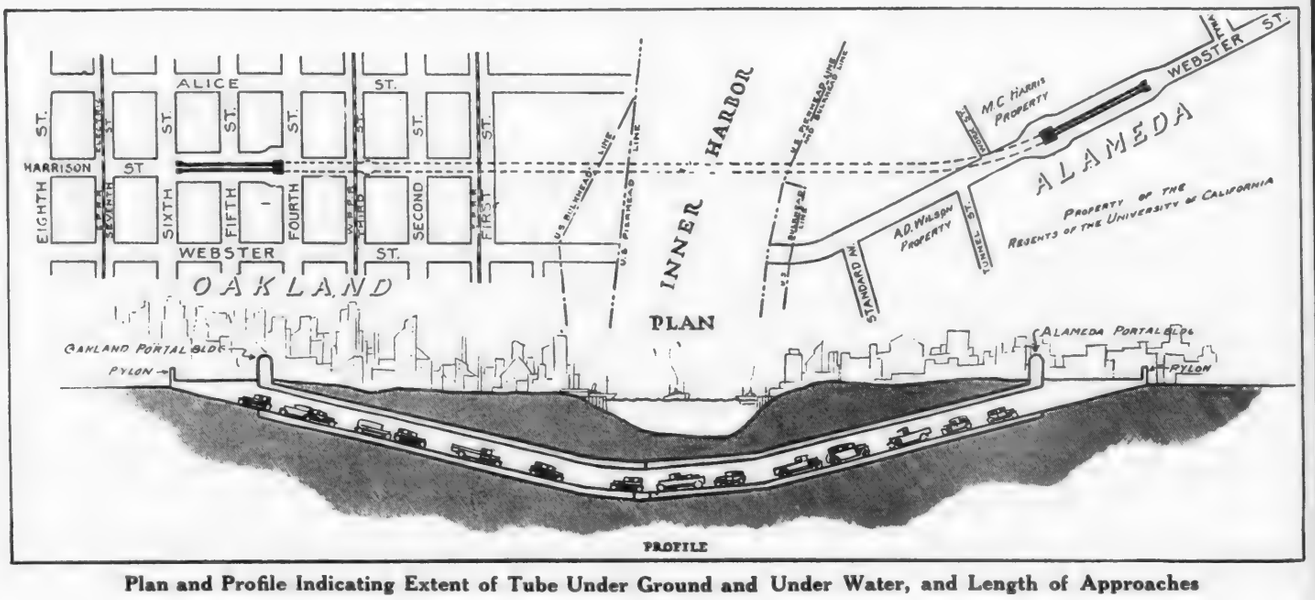
The World's Largest Underwater Tube

WHAT is described as the largest underwater tube in the world, connecting Oakland and Alameda, Calif., marks the culmination of twelve years of effort to solve the question of uninterrupted automobile traffic between these two cities. No longer will it be necessary for motorists to await the opening of the bridge, which heretofore has carried the bulk of the automobile traffic. The problem had become greatly accentuated due to the rapidly developing water-borne traffic on the estuary.

Named for and in recognition of the services of its chief engineer, the George A. Posey Tube, as it is known, represents an investment of $4,500,000. It has an outside diameter of 37 ft., which is some 7 ft. in diameter in excess of the largest tube heretofore built. It is also the first pre-cast tunnel to be constructed. Each section is 203 ft. long of reinforced concrete. The sections were built in a dry dock, then towed across the bay and sunk in position in an open trench prepared for the purpose.

Cross Section Showing Relative Location of Air Ducts and Vent Slots

Ventilation is designed on the continuous transverse principle. The



Plan and Profile Indicating Extent of Tube Under Ground and Under Water, and Length of Approaches

Interior of Tube Showing Ceiling Air Ports and Hub Height and Air Inlet Slots

ventilating buildings, one located at each end of the tube, contain in all eight Sturtevant "Silentvane" blower fans driven by Lincoln motors and Link-Belt chain drive. There are also four Sturtevant "Silentvane" exhaust fans in each of the ventilating buildings, making a total of sixteen fans, each 17 ft. in height and 8½ ft. wide.

Each fan motor is of the changeable pole induction type, with four changes of speed, driving the fans at 450 R.P.M. at 5 H.P.; 600 R.P.M. at 15 H.P.; 900 R.P.M. at 30 H.P.; and 1200 R.P.M. at 75 H.P. All of the fans are operated automatically by means of carbon-monoxide recorders installed in the operating rooms, which regulate automatically the required horsepower according to the carbon monoxide content of the air.

The carbon monoxide detector consists essentially of a cell and a flow meter. In the cell is an active chemical and thermocouples. The chemical, known as Hopcalite, has for its purpose the catalytic oxidation of carbon monoxide. As such it generates heat in proportion to the amount of carbon monoxide present. The thermocouples, which are connected to the graphic recording potentiometer, thus register the carbon monoxide present in the sample which is taken from the exhaust ducts.

The flow meter is a device which passes a continuous sample through the Hopcalite at a uniform rate of flow. Thus the carbon monoxide is recorded continuously on the chart in parts per million.

In case of emergency or when the carbon monoxide control is shut down, the fans are operated under the same combination of schedules by means of a program clock working the same combination as the carbon monoxide recorder, but according to a schedule as prepared on the clock tape. The fans also can be operated by push button control from the operating rooms or manually. A total of 1,000,000 cu. ft. is supplied every hour, furnishing 40 complete air changes during that period. R. W. Myers, consulting electrical engineer, Oakland, worked out this system of control.

Fresh Air and Exhaust Ports at 15-ft. Intervals

Fresh air is carried in large ducts under the roadway of the subway. The air passes through flues at 15-ft. intervals to a continuous expansion chamber under each sidewalk. From this chamber the air is delivered to the roadway through continuous adjustable slots in two horizontal sheets at hub-cap levels. After mixing with the warm motor gases, the air rises vertically to the ceiling of the tube and is drawn through the ceiling ports by the 8-ft. exhaust fans. The ports are arranged in pairs at 15-ft. intervals. Above the ceiling ports is a large air duct through which vitiated air is drawn to the ventilating buildings or por-

Supply Fan for Oakland-Alameda Tunnel

Typical Exhaust Fan Installation, Oakland-Alameda Tunnel

tals where it is exhausted into the atmosphere through large stacks.

A 9 ft. x 18 ft. damper door of heavy steel construction, hinged at the bottom and located at the entrance to the fan compartment of each exhaust fan, is opened and closed automatically in accordance with the operation of the exhaust fans. Each damper door is controlled by a special motor operating a shaft and chains, the motor being controlled by a fly-ball governor. Hand wheels and chains also are provided for manual operation of each damper door. Each exhaust fan compartment is provided with glass-covered peep holes.

Three independent sources of electrical power interconnected by automatic switches are provided so that there is no hazard of an interruption of power supply. Three independent cables, two from the Oakland side and one from the Alameda side supply electric current both from the hydro-electric and steam plants of the Pacific Gas and Electric Company and the Great Western Power Company.

In addition to the other equipment, at each tube signal station there are holes in the hand railings to provide ventilation for pedestrians using the sidewalk.

If, in spite of all precautions, there should be trouble with the ventilating system, "Stop Engines" signal will be flashed, thereby preventing further contamination of the air until the system is placed in operation again.

General Data on the George A. Posey Tube

Total length of tube	4,436.5 ft.
Total length of covered portion	3,545 ft.
Maximum depth of roadway below mean low water	67.74 ft.
Outside diameter of tube	37 ft.
Inside diameter of tube	32 ft.
Distance between curbs	22 ft. 10 in.
Distance between sidewalks	24 ft. 8 in.
Width of sidewalks	3 ft. 5 in.
Head room, roadway to ceiling	14 ft. 10 in.
Oakland grade	4.59%
Alameda grade	4.50%
Capacity of tube per hour	4,224 vehicles
Speed of traffic	20 mi. per hr.
Spacing of vehicles	50-ft. intervals
Maximum supply of fresh air	1,000,000 cu. ft. per min.
Number of air changes	40 per hr.
Dilution of carbon monoxide to air	4 parts in 10,000
Time to complete construction	40 months

Handbook of Refrigerating Engineering

Handbook of Refrigerating Engineering was written by W. R. Woolrich, professor of mechanical engineering at the University of Tennessee, for two groups of engineers. It was developed primarily as a series of lectures for the operating and constructing engineer of mature years who desires a complete course on refrigerating engineering, but requires it to be arranged in definite learning order so that he can master the fudamental ideas before being confronted with the heavier mathematical discussions involving thermodynamic equations.

Second, it was developed for the students of junior and senior rank in American engineering colleges who are to receive at least a one-term course in refrigerating engineering, supplementing their regular course in theoretical thermodynamics and steam laboratory.

The result is that the book is simple and easily understood and can be mastered by anyone with a fair knowledge of physics, mathematics and chemistry. Various refrigerating mediums, including the seventeen principal potential refrigerants, are discussed in detail and instructions given for the selection of the refrigerant for specific work. The more important refrigerants, such as ammonia, are taken up in special chapters, and include tables of properties, super-heat values, etc. The refrigeration systems themselves are first thoroughly discussed and illustrated, a chapter being devoted to each important part.

Other chapters include electric refrigeration, heat transfer, refrigeration constants, the absorption method, the absorption machine, ice-making systems, refrigeration equations, and testing the refrigerating plant. Numerous tables relating to the art of refrigeration are presented in the appendix.

Published by D. Van Nostrand Co., Inc., 8 Warren St., New York. Size 5 in. x 7 in. Pp. 331. Price, $4.

List of Approved Gas Appliances and Tubing, as of September 1, 1929, has been published by the American Gas Association Testing Laboratory. All appliances approved by the testing laboratory are included, the list being arranged alphabetically as to the manufacturer's name. Each month, a complete booklet, including the name and number of all gas appliances approved by the laboratory at the date of issue, will be supplied to supersede all previous lists. Subscriptions to this booklet may be secured at $2 per year from the American Gas Association Testing Laboratory, 1032 East 62nd St., Cleveland, O.

American Gas Association Convention Program

WHILE the exhibits will constitute the spectacular feature of the forthcoming convention of the American Gas Association, to be held in Atlantic City, October 14-18, at the new Municipal Auditorium, the technical program provides a wealth of interesting papers and reports, dealing particularly with the advances in the use of both natural and manufactured gas for house-heating. Many of them will be broadcast over the network of the National Broadcasting Company.

Following is the schedule of meetings arranged by days for the convention week:

Monday, October 14

9:00 a.m. Exhibition opens
10:30 a.m. Manufacturers' Section meeting
2:00 p.m. Women's meeting
5:00 p.m. Executive Board meeting

Tuesday, October 15

10:00 a.m. General Session
2:00 p.m. Natural Gas Department meeting
2:30 p.m. Commercial Section meeting
3:00 p.m. Technical Section meeting

Wednesday, October 16

10:00 a.m. General Session
2:00 p.m. Publicity and Advertising Section meeting
2:00 p.m. Industrial Gas Section meeting
2:00 p.m. Accounting Section meeting
2:30 p.m. Commercial Section meeting
3:00 p.m. Technical Section meeting

Thursday, October 17

10:00 a.m. General Session
2:00 p.m. Accounting Section meeting
2:00 p.m. Industrial Gas Section meeting
3:00 p.m. Technical Section meeting

Among the reports which will be presented for discussion at the convention are the following:

Natural Gas Department

Tuesday afternoon, October 15, Room F, Municipal Auditorium.

Modern Pipe Line Construction methods, Elmer F. Schmidt, Lone Star Gas Co., Dallas, Texas.

The Underground Storage of Gas, S. W. Meals, Carnegie Natural Gas Co., Pittsburgh, Pa.

Natural Gas Rates and Cost Allocations, F. C. Hamilton, Henry L. Doherty & Co., New York.

Commercial Section

Tuesday afternoon, October 15, Room B, Municipal Auditorium.

Sales Progress in House Heating, H. B. Johns, The People's Gas Light and Coke Co., Chicago, Ill.

The Importance of Insulation in the Future Development of House-Heating, Paul V. Close, American Society of Heating and Ventilating Engineers, New York.

Water Heating papers by M. B. Buckley, Kansas City Gas Co., Kansas City, Mo., and H. E. Dexter, Central Hudson Gas and Electric Corp., Poughkeepsie, N. Y.

Industrial Gas Section

Wednesday afternoon, October 16, Room C, Municipal Auditorium.

Conversion Burners for Large Volume Water Heating, A. A. Pihlman, Consolidated Gas Company of New York.

Thursday afternoon, October 17, Room C, Municipal Auditorium.

Review of Results Obtained with and Forecast of Possibilities for Further Development of Off-Peak Rate Schedules, E. L. Wilder, Rochester Gas and Electric Corp., Rochester, N. Y.

Manufacturers' Section

Monday morning, October 14, Room C, Municipal Auditorium.

Address by Chairman H. Leigh Whitelaw, American Gas Products Corp., New York.

In addition, D. S. Reynolds, of the Boston Consolidated Gas Company, will have a report on "Large Building Heating," while a paper on "Warm Air Heating with Unit Heaters," will be presented by W. L. Thompson, of the Columbus Heating and Ventilating Company. F. M. Rosenkrans, of the Gas Service Co., Kansas City, Mo., will discuss the use of fans in connection with gas-fired warm-air furnaces.

Two committee reports will be of particular interest to the heating and ventilating industry. One is, "Inspection and Service Manual," which will be presented at the convention by a committee of which J. D. Preble, of the Public Service Company of Northern Illinois, Chicago, is chairman.

A report which will be looked forward to eagerly as showing the growth of gas for house-heating during the past year is that containing the usual statistical tabulation indicating the number of gas-fired central house-heating plants sold by approximately 250 companies during 1928-29.

It is expected that the report of the committee on house-heating will show that automatic heat as exemplified by gas appliances will show a gain comparable with or perhaps exceeding that of competing fuels.

Gas conversions have been a bone of contention to gas companies for many years. In the natural gas field they were accepted without question for the most part, but manufactured gas companies have handled this equipment gingerly and have installed such equipment in comparatively few cases. Since the last gas convention, however, manufactured gas companies are viewing these devices in a more favorable light, and several companies have begun agressive campaigns to sell conversions to the public. It seems safe to predict that the next year will show a tremendous increase in the use of this equipment.

Over fifty manufacturers of the equipment used in the heating and ventilating industry will exhibit at the convention. This will include displays of gas-fired boilers, furnaces, radiators, insulation, gas conversions, gas-fired unit heaters, hot water specialties, welding equipment, thermostatic controls, pipe, filters, etc.

HEATING AND VENTILATING cordially invites those attending the convention to make its booth, No. 123, their headquarters at the Municipal Auditorium.

The committee on house-heating is composed of the following members:

H. B. Johns, chairman, The Peoples Gas Light & Coke Co., Chicago, Ill.
W. A. Burrell, Gannett, Seelye & Fleming, Inc., Harrisburg, Pa.
F. M. Cheif, Public Service Co. of Colorado, Denver, Colo.
W. B. Clemmitt, Consolidated Gas Electric Light & Power Co. of Baltimore, Baltimore, Md.
Leo Croner, Portland Gas and Coke Co., Portland, Ore.
H. H. Dugdale, American Gas Products Corp., New York, N. Y.
C. M. Grow, Southern California Gas Co., Los Angeles, Calif.
Thomson King, Peerless Heater Co., Boyertown, Pa.
N. A. Newton, Oklahoma Natural Gas Corp., Tulsa, Okla.
A. A. Pihlman, Consolidated Gas Co. of New York, New York, N. Y.
R. E. Polk, Equitable Gas Co., Pittsburgh, Pa.
J. D. Preble, Public Service Co. of Northern Illinois, Chicago, Ill.
D. S. Reynolds, Boston Consolidated Gas Co., Boston, Mass.
F. M. Rosenkrans, The Gas Service Co., Kansas City, Mo.
E. R. Rothert, Union Gas & Electric Co., Cincinnati, O.
H. H. Skinner, 1111 Old Orchard Ave., Dayton, O.
W. E. Stark, Bryant Heater & Mfg. Co., Cleveland, O.
H. A. Sutton, Public Service Electric & Gas Co., Newark, N. J.
W. L. Thompson, Columbus Heating & Ventilating Co., Columbus, O.
C. W. Waddington, The Brooklyn Union Gas Co., Brooklyn, N. Y.
H. E. G. Watson, Consumers Gas Co. of Toronto, Toronto, Ontario, Canada.

Coal, Gas and Oil Have Their Day at the National Fuels Meeting

WITH an entire evening given over to a symposium on domestic heating, open to the general public and embracing a general discussion of gas, oil, electricity, anthracite, bituminous coal and coke, the forthcoming series of National Fuels Meetings to be held in Philadelphia, October 7-10, promises some lively discussions, which will be well worth hearing by heating men. The meeting is being staged by the Fuels Division of the American Society of Mechanical Engineers, and will take the form of a massed attack on their old enemies of waste, inefficiency, smoke, and general ignorance of best practice.

One of the most outstanding programs ever arranged by the Fuels Division will fill every available moment of the sessions which are to be held at the Bellevue-Stratford Hotel. Over 30 papers are scheduled for presentation, including those on power plant problems, low-temperature carbonization, industrial fuels, stokers, and smoke abatement. An entire evening, Wednesday, October 9, will be given up to the symposium on domestic heating.

Arrangements made for the entertainment of the visitors will give the meeting an importance comparable to that of the society itself. The plans include a visit to the plant of the Curtis Publishing Company, and the Campbell Soup Company in Camden. On Tuesday afternoon, October, 8, there will be a tour of Philadelphia's points of interest. Wednesday afternoon, October 9, will be spent at Valley Forge; and Thursday afternoon will be given up to an inspection of the Sears Roebuck establishment in Philadelphia.

Following is the program of the meeting:

Monday, October 7

8:30 a.m. Registration, Bellevue-Stratford Hotel.

10:30 a.m. Opening Session.
Opening Address: The Fuel Engineer, His Training and Work, Prof. R. H. Fernald, University of Pennsylvania, Philadelphia, Pa.

2:00 p.m. General Session.
Economics of Pulverized Coal, Gas, and Oil Fuels, Martin Frisch, engineer in charge of development, Combustion Engineering Corp., New York.

2:00 p.m. Domestic Session.
Some Fundamentals of the Domestic Heating Problem, Samuel S. Wyer, consulting engineer, Columbus, O.
Stokers for Apartment Houses and Office Buildings, Joseph Harrington, president, Joseph Harrington Co., Riverside, Ill.

Tuesday, October 8

9:30 a.m. General Session.
Economics of Reclamation of Anthracite Culm, Frederick H. Dechant, consulting engineer, W. H. Dechant & Sons, Reading, Pa.
Cleaning of Anthracite, T. M. Chance, consulting mining engineer, H. M. Chance & Co., Philadelphia, Pa.
Coal Pretreatment, Clarence B. Wisner, president, Carbocite Co., Canton, O.

9:30 a.m. Stoker Session.
Symposium on Recent Developments in Mechanical Stoker Design.
Presentation, H. D. Savage, president, Stoker Manufacturers' Association. Co-authors: R. A. Foresman, chief engineer, Stoker Department, Westinghouse Electric & Mfg. Co., Philadelphia, Pa.; J. G. Worker, general sales manager, American Engineering Co., Philadelphia, Pa.; J. W. Armour, engineering manager, Riley Stoker Corp., Worcester, Mass.

9:30 a.m. Industrial Session.
Fuel Burning in Ceramic and Lime Industries, Victor J. Azbe, consulting engineer, St. Louis, Mo.
Economics of Industrial Heating Practice, J. A. Doyle, vice-president, W. S. Rockwell Co., New York.
Use of Fuel in the Manufacture of Portland Cement, H. P. Reid.

2:00 p.m. Industrial Session.
Electricity for Industrial Heating Furnaces, W. S. Scott, Westinghouse Electric & Mfg. Co., Mansfield, O.
Gas for Industrial Heating Furnaces, H. O. Loebell, chief engineer, Combustion Utilities Corp., New York.
Oil for Industrial Heating Furnaces, Leod D. Becker, president, Electrol, Inc., New York.

Wednesday, October 9

9:30 a.m. General Session.
Carbonization Plant, "Lurgi" Process of Lehigh Briquetting Co., Max Toltz, St. Paul, Minn.
The Hayes Process Low-Temperature Carbonization Plant at Moundsville, W. Va., J. D. McQuade, Ben. Franklin Coal Co. of West Virginia, Moundsville, W. Va.

9:30 a.m. Power Plant Session.
Some Economic Considerations of Water Wall Installations, Ollison Craig, consulting engineer, Riley Stoker Corp., Worcester, Mass.
Economics and Design of Water-Cooled Furnaces, J. S. Bennett, engineer, and P. N. Oberholtzer, Engineering Department, American Engineering Co., Philadelphia, Pa.
Effect of Fouling in Boiler Efficiency, J. W. Pierson.

8:00 p.m. Domestic Session.
Symposium on Domestic Heating.
Economics of House Heating and Insulation, H. B. Johns, Peoples Gas Light & Coke Co., Chicago, Ill.
Gas, M. J. Roberts, president, Roberts-Gordon Appliance Co., Buffalo, N. Y.
Oil, S. D'Arcy Rickard.
Electricity, A. R. Stevenson, Jr., Engineering Department, General Electric Co., Schenectady, N. Y.
Anthracite, A. F. Duemler, manager, Anthracite Coal Service, New York.
Bituminous, F. R. Wadleigh, cosulting engineer, New York.
Coke, P. Nicholls, U. S. Bureau of Mines, Pittsburgh, Pa.

Thursday, October 10

9:30 a.m. Smoke Abatement Session.
Smoke Abatement, Harvey N. Davis, president, Stevens Institute of Technology, Hoboken, N. J.
Smoke Abatement at Salt Lake City, J. Billeter, chief smoke inspector, Salt Lake City, Utah. Smoke Abatement at Nashville, Tenn., George C. Fisher, chief smoke inspector, Nashville, Tenn.
Smoke Abatement at Knoxville, Tenn., F. L. Wilkinson, Jr., chief engineer, Bureau of Smoke Regulation, Knoxville, Tenn.

2:00 p.m. Smoke Abatement Session.
Atmospheric Pollution and Sunlight, Philip Drinker, assistant professor of ventilation and illumination and Department of Physics, Harvard University, Cambridge, Mass.
Symposium on Methods of Recording Smoke Density. Papers by A. S. Langsdorf, acting dean, Schools of Engineering and Architecture, Washington University, St. Louis, Mo.; H. V. Breisky, Supply Engineering Department, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., and Victor J. Azbe, consulting engineer, St. Louis, Mo.

Papers Presented at Third National Meeting of A. S. M. E. Fuel Division Philadelphia, October 7-10

Gas as a Domestic Heating Fuel

by **M. J. ROBERTS**

President, Roberts-Gordon Appliance Corp., Buffalo, N. Y.

WHEN we look back over the past few years and consider the changes that have taken place in the industrial and home life of America, it does not seem possible that this period of rapid development and improvement can continue. Yet each day we see something new, a machine or method which overnight changes the habits of a nation. The automobile, airplane, radio and talking movies are perhaps more prominent than others, but the ordinary home labor-saving devices, the washing machine, electric cleaners, irons, automatic cook stoves, domestic water heaters and numerous other appliances have given the women in the average home comforts beyond their dreams of 20 years ago.

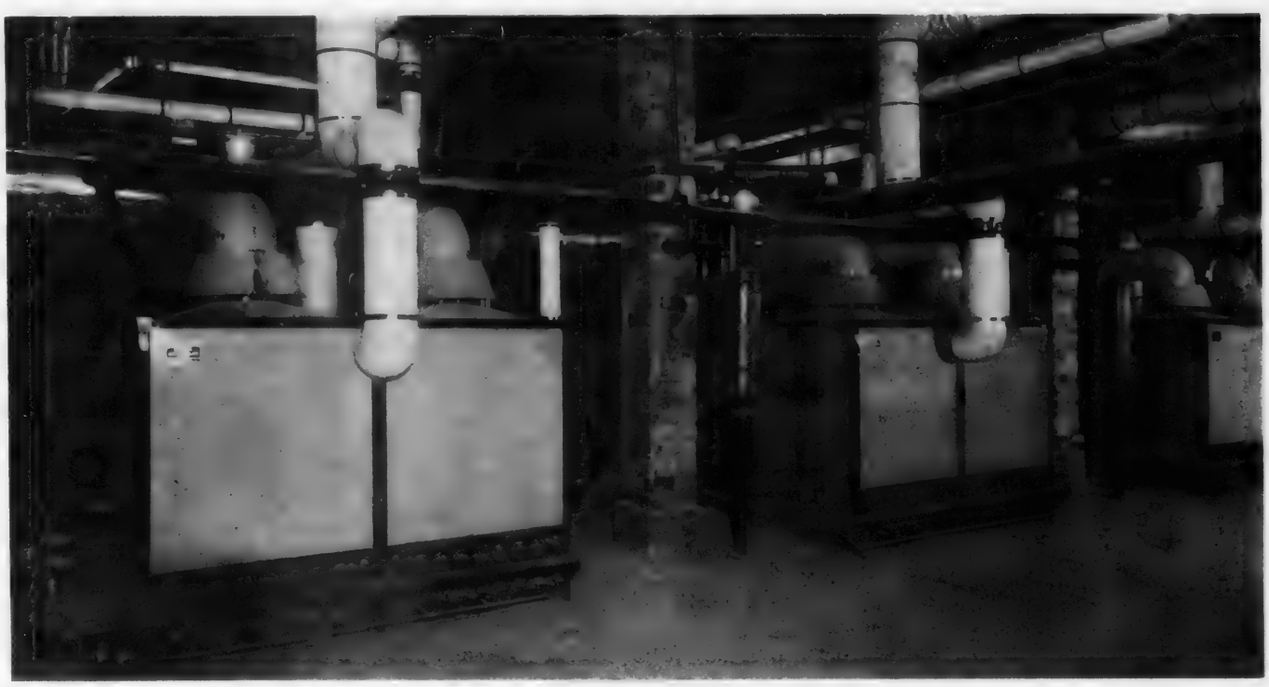
For some time, there has been a quiet revolution against the existing comparatively crude methods of heating. The general dislike for coal and ashes, and the dust, grime and drudgery has brought about a new era in the heating of homes.

The first use of gas as a fuel in the United States was in the natural gas territories of Pennsylvania, and although in common use for 30 years the development has been very slow. Burners having no means of mixing air were first used in coal and wood stoves of that time. Later space heaters and asbestos reflector fireplaces displaced the cruder equipment.

For quite a period no radical improvements were made in the gas heaters, but some effort was made to build burners for central heating plants. No gas-appliance manufacturer seemed interested in this market. Therefore, home-owners, plumbers and a few gas men built every conceivable type of burner and struggled along.

During this experimental stage, attempts were made to use manufactured gas, but due to the low burner efficiency and the high price of fuel, very little progress was made; in fact, these attempts did more to discourage the use of gas than any other particular thing in the industry. Finally, the gas-fired boilers and warm-air furnaces were designed, and from that point there was a rapid improvement in all gas equipment, as well as in its sale. The comparatively high price of straight gas-fired boilers and the missionary work necessary to sell the public on gas as a fuel retarded the progress of this particular field to some extent.

As the gas-designed equipment improved, the gas industry became sold on the possibilities of this large potential market for the sale of gas in the homes. Due to the volume of sales, it was possible to reduce the rates on gas and still show a profit. Special rates were approved for house-heating, engineers were given charge, and with greater care in installations, the drive was on.



Battery of Gas Heating Boilers in New Tammany Hall, New York

Virtually all boilers designed for the use of gas were of cast-iron construction, usually rectangular in shape, and were built up in sections. This eliminated the necessity for a large number of different-sized units, as a boiler could be assembled to fit a particular home. Various methods were used to secure the greatest possible heating surface and length of fire travel in a small and compact unit. Staggered sections, and small flue openings, fins, irregularities or pin-type castings were also common practice. In all these types low-pressure atmospheric burners were used, delivering convected heat at an average temperature of 1500° F. No attempt was made to secure a very fine adjustment on either the air or gas.

Automatic devices were used in nearly all installations; that is, a room-temperature control, automatic pilot, cutting off gas in case of pilot-flame failure, low-water and steam-pressure controls, and, in practically all cases, neat insulated jackets were included as part of the boiler, giving a very attractive appearance when the installation was completed.

The warm-air furnaces were of sheet-metal construction, although cast-iron is being used to some extent today, and were made in both round and rectangular shapes. A very long fire travel is necessary in these units. In both types, the rotary circulating and the up-and-down principles are used. Armco iron, and other rust-resisting materials, as well as cast-iron, is used in certain parts of furnaces to increase their life. Room temperature, air temperature, and, in some cases, humidity controls, were sold as standard equipment.

Straight gas-designed equipment is limited to approximately 80% efficiency due to condensation troubles. Flue gases must leave the boiler at approximately 300° F., or water vapor in the products of combustion will often condense, and, due to the sulphur content of the gas, form a weak solution of sulphuric acid, which, in time, will eat out the chimney, stack, and heating equipment. To avoid this condition it is necessary to use a condenser, which necessitates water connections and, in some cases, an exhaust fan. Due to the cost of this additional equipment and the troubles from the same, they are not commonly used. Using condensing equipment, thermal efficiencies as high as 93% have been obtained.

Due to the high cost of gas-designed equipment only a certain portion of the potential market has been reached, namely, the wealthier class. The average customer refused to scrap his coal-burning appliances. This created a demand for burner equipment to convert the coal appliances to gas, at the same time obtaining an efficiency reasonably close to that of equipment originally built for gas. Burners were, therefore, designed to take care of this field.

The gas burner had many problems to contend with—it should be made in a complete unit ready to install, completely automatic in order to obtain as high efficiency as possible, as well as safety, and adaptable to the different makes, sizes, shapes and types of furnaces or boilers. Simplicity of construction is essential in order that the installation and service expenses may be kept within reasonable bounds, and an attractive appearance when installed in the home also must be maintained. The hourly gas capacity must be adjustable to take care of the various heating demands, and the burner must take care of the different classes of manufactured and natural gases having heat values ranging from 250 to 1250 B.T.U. per cu. ft., as well as the varying peculiarities of the gases, and still obtain a comparatively high efficiency.

One of the first problems was to replace as nearly as possible the conditions in the heating appliances as when using coal or other fuels. Three general types of burners have been designed to accomplish this purpose—the blower, the atmospheric and the radiant atmospheric.

The blower burner consists of a motor-driven fan and a means of mixing gas and air in their correct proportions. Some of these are the blast type, having a large nozzle which is inserted in the firepot of furnace or boiler, throwing the flame against fire brick material in such a manner as to get the best distribution of heat. Others are equipped with special burner heads, which distribute the heat around the firepots, or to that point which gives the best possible results.

Atmospheric burners are made in several shapes, and usually are built to conform in shape and size with different firepots. They have no means for controlling the supply of air, and depend entirely upon the convected heat for results. These burners are the cheapest to construct, but, due to the fact that the efficiency is comparatively low, they are rapidly being discarded.

Radiant atmospheric types are being built with and without air controls; the better type, having primary and secondary air adjustments, as well as automatic air cut-off when the burner is not in operation. This type operates on a Bunsen flame which is directed against a refractory or china-clay baffle set in the firepot in such a manner as to restrict the size of the combustion chamber and to reflect the heat against the firepot wall. The better burners of this type operate on approximately the same efficiency as the straight gas-fired units.

It has been found, in comparison with other fuels for house-heating, that 37,000 cu. ft. of 540-B.T.U. manufactured gas is equivalent to one ton of hard coal; 23,000 cu. ft. of 850-B.T.U. gas is equivalent to one ton of hard coal, and 18,000 cu. ft. of natural gas is equivalent to one ton of hard coal. One thousand cu. ft. of 540-B.T.U. gas is equivalent to 6 gal. of fuel oil of the average quality, and 1,000 cu. ft. of natural gas at 1000 B.T.U. is equivalent to 11 gal. of fuel oil.

Any one interested in gas for heating can secure from the American Gas Association, the house-heating manual which covers this subject thoroughly, including charts and tables for the estimation of gas by the degree-day method. This manual goes thoroughly into the different types of heating systems, and into all types of building construction for heat-loss calculations.

In conclusion, it might be said that, due to the many advantages in the use of gas for house-heating and the freedom from dirt, ashes and oily grime, the fact that the fuel is carried under the streets and paid for after being used, the universal improvement by the gas utilities in the expansion of the distribution systems, holders and line capacity to take care of this load, as well as reduction of gas rates on a quantity basis, there appears to be but one answer to the domestic heating question and that is, the United States will be heated with gas as a fuel within the next few years.

New Jersey Wins Lower Gas Rate

Gas rates of the Public Service Company of New Jersey have been revised according to a decision recently handed down by the Public Utilities Commission. Though small users will pay more than formerly for their gas, those people using more than 3200 cu. ft. a month will be able to buy it at 95 cents per 1000 cu. ft. instead of $1.20. The cost of various quantities of gas under the old schedule and under the new schedule follows:

Cubic Feet	Old Rate	New Rate
200	$1.00	1.00
400	1.00	1.00
600	1.00	1.22
800	1.00	1.44
1000	1.20	1.66
1200	1.44	1.88
1400	1.68	2.10
1600	1.92	2.29
1800	2.16	2.48
2000	2.40	2.67
2200	2.64	2.86
2400	2.88	3.05
2600	3.12	3.24
2800	3.36	3.43
3000	3.60	3.62
3200	3.84	3.81

Oil Fuel for Homes

by **S. D'Arcy Rickard**

President, Rickard Engineering Corp., Brooklyn, N. Y.

(Presented at Third National Meeting, A.S.M.E. Fuels Division, Philadelphia, October 9)

IF we make a very careful investigation of all of the more successful types of domestic oil burners we find successful makes of domestic burners using all of the industrial methods with the exception, of course, of the use of high-pressure steam. In short, modern domestic burners are simply miniature industrial oil-burning systems plus automatic control equipment.

It has not been as simple as it might first appear to construct these miniature oil-burning systems. In the first place, there was the necessity of eliminating the excessive noise that went hand in hand with the industrial oil burner. No equipment that was entirely satisfactory or small enough could be bought in the open market. Fractional horsepower electric motors were more or less toys requiring constant attention. It was impossible to buy efficient and quiet running blowers, oil pumps, etc., in the very small sizes required. The largest problem, however, was the development of reliable automatic control and safety equipment.

The conditions today are entirely different. The engineer now building a domestic oil burner can buy on the open market, from a number of sources, electric motors, blowers, oil pumps, control and safety devices that have thoroughly been proved and possessing the greatest reliability and highest efficiency.

If all the good things said about oil burners in the foregoing are true, the question arises as to why 2.7% of those owners investigated by the Oil Heating Institute were not satisfied with their oil burners; why any service calls were necessary, and why 2% of this service was not satisfactory, etc. Although it will probably never be possible to give 100% satisfaction to 100% of the people, it is interesting to determine whether this is due to human or mechanical imperfections.

Some light may be thrown on the subject by the results of a careful investigation by one particular manufacturer of all of his users. He found that 98% were entirely satisfied while 2% were very much dissatisfied. The dissatisfied ones had done so much more talking than the satisfied ones that the old saying that "bad news travels faster than good news" was thoroughly proved. A very careful investigation of the troubles that caused these few to be dissatisfied revealed that in most cases there were minor defects in equipment and mistakes in the installations which were quickly remedied and the users satisfied.

The trouble in the other cases, however, was not so easily settled. In every one of these cases it was found that the oil burner was working perfectly but the boilers to which they were attached were seriously overloaded or were in all cases much too small for the loads placed upon them. In a few cases the stacks or chimneys were much too small for these boilers even had they not been overloaded. In one case the boiler was less than half the size it should have been and, although the manufacturer called for a stack 14 in. in diameter and 35 ft. high, the boiler had a stack 8 in. in diameter and 10 ft. high.

75% of Installations Made in Existing Heating Plants

Of course the dealer who attempted to apply his burner under these conditions should have known better. As it was, the only remedy was to install new, larger boilers and build new, larger chimneys of proper size. It is to prevent just such sad experiences that the help of the consulting engineer is most needed. It has been found that approximately 25% of the domestic oil burners are installed in new homes while the other 75% are applied to existing heating plants. As a rule, less difficulty is encountered in the new home where the boiler and the burner may be selected to complement each other and where more modern engineering practice is usually applied. In the old homes, where we find many boilers and chimneys too small for the load, the wise dealer has learned by experience that there is no way of making two plus two equal five and he now insists that defective or undersized heating equipment be corrected before he installs his oil burner.

Due to the fact that most oil-burning industrial furnaces and ovens have no stack and that in the operation of oil-fired power boilers a smaller stack can be used with oil than with coal—a result of the elimination of the coal bed and grate bars—the impression has come to many engineers that in domestic oil-fired boilers the stack is of minor importance. This is far from the case.

It will be appreciated that a back pressure or an internal pressure greater than the atmospheric pressure is desirable in the operation of most industrial furnaces and that it is under almost a balanced-draft condition that we secure the highest efficiencies with power boilers. But with a power boiler we do not obtain this balanced-draft condition immediately upon starting the fire.

We must, with either coal or oil, open the air inlet and breeching dampers wide in order to get a free flow of air. As the stack warms up and the draft increases, we gradually close the breeching damper until almost a balanced draft has been secured or until the atmospheric pressure is very little higher than the pressure in the fire box. However, it would not be possible to start a fire or get up steam if an attempt were made to start with the dampers closed to this extent. Also, a considerable amount of fuel would be wasted if the dampers were left wide open at all times allowing a large percentage of the heat to be drawn up the stack.

Now picture the conditions of a domestic boiler or furnace fitted with an automatic oil burner. No one is present to adjust the oil supply or stack damper. We do not want a back pressure or a fire-box pressure greater than the atmospheric pressure or the products of combustion will be forced through the cracks of the boiler doors into the home. In fact, we must at all times have a partial vacuum in the boiler to prevent this.

The operating conditions are: The oil burner is left adjusted to burn a certain number of gallons of oil per hour, depending on the size of the home, so as to bring the home up to temperature in the coldest weather within a reasonable length of time. The room thermostat automatically has shut down the burner, the chimney is gradually cooling and therefore gradually losing its draft or suction qualities. Then the room thermostat suddenly calls for heat, the burner is automatically started at full fire and the chimney is instantly required to carry off the spent gases of the maximum amount of fuel when it is coolest and least fitted to do so.

In other words, there is no building up process from minimum fire with minimum draft to maximum fire with maximum draft as is the case with hand-fired boilers. That is why it is possible to get up steam and a satisfactory de-

gree of heat with a coal-fired boiler that has too small a stack and why it is not possible to give satisfactory results with oil.

When the boiler is too small, and so must carry an extra large flame, and when the stack is too small for the boiler and is unable to carry this sudden demand in starting, the pressure in the fire box is for the moment greater than the atmospheric pressure; therefore, the boiler is inclined to puff back. This, in time, will throw the burner out of adjustment and these gases, forced out of the boiler, cause a smell of oil in the house. The same burner applied to a boiler with the correct size of stack would function perfectly and there would be absolutely no smell of oil in the home.

Most modern domestic oil burners are fitted with fans or blower wheels to supply the air necessary for combustion. The manufacturer rates the oil-burning capacity of his burner on the air capacity of this fan or blower and he usually figures that 1800 cu. ft. of free air is necessary to burn 1 gal. of oil at sea level. If the boiler has a good draft the capacity of this fan is increased as the stack draws air through it naturally.

On the other hand, if the stack is too small to carry off the products of combustion as fast as they are created, the fan cannot deliver its maximum capacity and the air is simply churned around inside the blower housing and the oil-burner man is blamed for overrating his burner. The author knows of a case where as high as 5 in. of draft was obtained at the base of the stack but there were so many air leaks between the sections of the boiler that the fire-box draft was less than .01 in.

With most domestic oil burners it will be found that a stack of the correct size and height for the correct size of coal-burning boiler will be best for oil fuel. The domestic burner is designed to meet this condition, as about 75% of those installed are applied to existing coal-burning boilers or furnaces.

Automatic Draft Regulators Secure Economy of Operation

It also will be appreciated that, under correct stack conditions, after the burner has started and the draft increases as it heats up, a large percentage of the heat generated is wasted by being drawn up the stack. In other words, the stack must be of ample size at the start but such a stack is much too big after the burner has been running for a few minutes. Therefore, in order to secure the greatest economy, every oil-fired domestic boiler should be fitted with an automatic draft regulator. There are now a number of these on the market which are very reliable and simple in design.

Another thing that has often caused trouble is the practically air-tight boiler room. Every boiler room should be fitted with a permanently open air passage at least twice the area of the stack.

Efficiency of Domestic Boilers and Burners

Consulting engineers often ask: "What is the efficiency of a certain domestic oil burner?" and "What is the best boiler to use with oil?"

From an economical standpoint the only thing the user is interested in is the percentage of the dollars he puts into his oil tank in the form of oil that he gets out in a satisfactory degree of heat; in other words, the overall efficiency of his entire heating system. To secure high overall efficiency, the burner must generate the heat in an efficient manner, the boiler must absorb this heat in an efficient manner and the piping system and radiators must carry and distribute this heat to the rooms in an efficient manner. Therefore, overall efficiency is dependent upon a number of different manufacturers, engineers and contractors, each of whom has a finger in the pie. The oil burner plays a comparatively small though important part in the entire system.

The U. S. Bureau of Mines has stated, based on extensive tests, that there is actually very little difference in burner efficiency alone between the better makes of automatic domestic oil burners on the market. This does not mean that there is not a difference in economy, as different burners are designed to burn different grades of oil at different prices, but there is very little difference in their ability to develop a very large percentage of the heat in the particular grade of oil fed to them. But we all know that there is a great difference in efficiency with any fuel between a cheap, poorly designed boiler that is too small for the job and a good, well-designed boiler of ample capacity, and it is only the combined boiler and burner efficiency in which we are interested.

The only figures that are of any value at all are those based on carefully-conducted tests. In making such tests it has been found that certain makes of burners are more efficient with certain types of boilers than others. Therefore, even the most carefully conducted tests are of little value unless the same type of both boiler and burner upon which the test figures are based are selected for the new job.

An oil-burner manufacturer might obtain some excellent sales data on the efficiency of his burner with a certain boiler and under certain conditions, but the same burner applied to a boiler too small for the job or one of the wrong type for this particular burner, or one poorly designed would result in great disappointment.

Of course, some types of oil burners are better fitted than others to get the most out of any type of boiler to which they might be applied, but it must be remembered that, no matter how good the burner may be, an inefficient boiler and heating system is still inefficient when changed from coal to oil.

The author does not want to convey the impression that it is not possible to get more heat out of a certain boiler with oil than it is with coal, but this is usually due to steady and regular firing with an automatic oil burner as compared to very irregular firing with coal, and it usually indicates that the boiler is too small for the job. We must realize that a boiler actually is a heat-absorbing device and that the oversized boiler with ample surface to absorb the maximum amount of the heat generated is always more economical than the overloaded boiler which can absorb only a small percentage of the heat, allowing the balance to escape up the stack.

Although it is possible to secure very high overall efficiency with a good oil burner correctly applied to a well-designed coal-burning boiler, there have been placed on the market within the last few years a number of boilers especially designed for burning oil. These oil-burning boilers embody the advantages of a correctly-designed fire box for oil, smaller and more closely spaced tubes, greater compactness, and they show exceptional economy. Therefore, it is suggested that, whenever possible, a boiler especially designed for burning oil be selected for the job.

Domestic Hot Water Supply

Another point of interest is the recently-developed system of taking care of the domestic hot water requirements in both summer and winter by the one oil burner. This is done by connecting a coil water heater and a storage tank to the main heating boiler just as is often done with a coal-fired heating boiler. In the summer, however, the oil burner on the heating boiler is kept in operation but is controlled entirely by the temperature of the water in the storage tank. This provides hot water automatically at a constant temperature, but the system is so designed that no heat is allowed to enter the heating system or radiators.

Oil for heating water with this system has shown an average saving over manufactured gas in an automatic gas heater of over 50%. There is also quite a saving in equipment. However, except in homes and the smallest apartment houses, a separate oil-burning water-heating boiler should be installed.

It is a well-known fact that no matter

how good the boiler, radiators and accessories may be, they are of little value unless correctly installed into a heating system by a man of experience and intelligence. The same is true of the installation of the oil-storage tank, oil burner, accessories, etc.

Many good oil burners have been condemned simply because they were not correctly installed. Just as in other new industries, the oil-burner industry has been faced with the necessity of developing and educating men correctly to install and maintain its products. Such a process naturally is slow and attendant with many mistakes, but today there is scarcely a town in this country where an experienced oil-burner mechanic cannot be found.

Maintenance of Domestic Oil Burners

It is surprising the number of people who expect a domestic oil burner to function perfectly year after year without any care or attention. A thousand oil-burning machines installed in a certain district must be maintained just as a thousand industrial machines installed in a large plant must be maintained and the means and expense of this maintenance service must be considered.

It is unfair and uneconomical to expect either the local dealer or the manufacturer to assume the expense of this maintenance service over a period of years or to require a so-called guarantee that eventually will cause the failure of both the dealer and manufacturer, leaving the user with an "orphan" on his hands. At the present time the practice among all of the successful oil-burner dealers is to allow the user what is called an "adjustment period." Depending on the dealer, this adjustment period extends for one month, three months or one year from the date the oil burner is placed in operation.

It is the author's personal belief that a 30-day adjustment period is of ample length to find and correct any so-called "bugs" or mistakes there may be in the installation. The burner then should function year in and year out with very little care and attention. There are today, many oil burners on the market that do not require lubricating oil or cleaning more than once or twice a year and, if left alone, will stay in perfect adjustment.

However, every oil burner does need at least this small amount of attention. Occasionally people allow their storage tanks to run dry or burn out the house fuses with a defective curling iron or flat iron. These are things that are easily fixed but the householder does not know what is the trouble with the burner and wants quick attention in cold weather.

To cover the expense of such calls, as well as to keep an eye on the burner so as to prevent the development of trouble, it is the practice for the dealer to make a contract with the user whereby the dealer agrees to make periodic inspections and adjustments and answer emergency calls for which he is either paid a fixed sum per year or per call.

So little trouble is now experienced with most correctly-installed modern oil burners that the expense of this maintenance service rapidly is being reduced to a very small amount and this method insures the most satisfactory results over a long period of years at the least possible expense to the user and at no loss to anyone.

From the foregoing it will be appreciated that there are many factors which make for success or failure in the installation of a domestic oil burner. On one side we have the buyer who often is entirely ignorant of the engineering problems involved. On the other side is the seller whose advice and suggestions are too often colored by self interest. To bring all these elements into harmonious unity is the task of the engineer.

Therefore, the author would make the following suggestions for the procedure of the consulting engineer in advising his clients on the selection of an oil burner and for aiding him in obtaining the satisfaction, comfort, convenience, cleanliness and economy that is afforded by correctly applied oil heat:

1. Make sure that the stack and heating system are all that they should be to secure satisfactory service with any fuel.

2. Select an experienced and successful oil-burner dealer within not more than 15 or 20 miles of the installation point. Troubles nearly always are very small ones, but the user does not know how to correct them and wants quick service in cold weather. If such a dealer cannot be found within this distance, do not put in a burner of any kind any more than you would buy an automobile that did not have a nearby dealer to service it.

3. When there are a number of good dealers in the district, select the one who handles the best oil burner, but find a good dealer first and a good oil burner second. Base your selection of the burner on quality or reliability, quietness and economy, as well as the manufacturer behind the burner. Quality of material and workmanship as well as correctness of design are of paramount importance, as these elements make for reliability and long life at low maintenance cost.

Any mechanical device in the home such as a washing machine, ice machine, etc., might get out of order without causing any great inconvenience, but an oil burner must function perfectly day and night and every day during the heating season. Only a quality product can insure such service.

Regarding noise, remember that there is no such thing as an absolutely noiseless oil burner. There is always some noise created in any form of combustion and it is almost impossible to construct an absolutely noiseless electric motor, blower, oil pump, etc. However, the experience and skill used in their design and construction has resulted in quite a number of domestic oil burners which are so quiet in operation that this point is never spoken about after the burner is installed. Economy, as explained above, is a matter of design of both boiler and burner, application of the burner and price of oil.

4. Do not buy on price alone. The cost of the oil burner itself is only one-third to one-half the total cost of the complete installation. The balance is made up in the cost of tank, pipe and fittings, electric material, fire brick, labor, etc. There is very little difference in cost between any of the better oil burners on the market today but there is often quite a difference in prices quoted between the dealer handling the cheap burner, doing cheap work and bound to fail and the dealer handling a good burner, doing first class work and so insuring his success. Only the successful dealer will be present to give maintenance service in future years.

Popular Research Narratives

Popular Research Narratives, Volume 3, collected by the Engineering Foundation, recently was published. Fifty additional short and non-technical articles on research in all fields are included in this unusually interesting volume.

Some of the chapters of particular interest to engineers are: Contour Mapping from the Air; Cast-Iron Pipe; Super-Conducting Copper; Pictures by Phone; Brass; Labor Saving in Tunneling; Quartz-Gallium Thermometers; Ductile Arc Welds; Grinding; Hardened Copper; Arch Dams; Ice; Straw Insulating Board; Ventilating Vehicular Tunnels; One Billionth of an Inch; Artificial Climates; House Heating and Ventilating, and Aluminum Plating.

Each of the chapters was written by an authority in that particular line, and in most cases by one of the men directly connected with that branch of research.

Published by The Williams and Wilkins Co., Mt. Royal and Guilford Aves., Baltimore, Md. Size 5 in. x 7¾ in. Pp. 174. Price, $1.

Anthracite as a Domestic Heating Fuel

by **A. F. DUEMLER**

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(Presented at Third National Meeting, A.S.M.E. Fuels Division, Philadelphia, October 9)

UNTIL five years ago anthracite as a domestic fuel in the area outlined was without competition, and the questions of smoke and air pollution due to domestic fuel consumption were negligible ones. However, the entrance of other fuels into this market during the last few years has developed a new era in the preparation, marketing, and utilization of anthracite which has proved profitable to the public as well as to the anthracite industry. The quality of the product being sent to market has been improved greatly through the extensive development of mechanical-cleaning methods.

Service Contact With the Consumer

In searching for a method of procedure to extend service to the consumer, it was found that all complaints from the customer to the retailer were based on quality of coal. This condition did not check with conditions at the mines where the installation of improved methods of preparation was resulting in the shipment of coal of high quality.

The retail dealer at that time was seriously handicapped in dealing with the situation because his knowledge of what constituted a good heating plant in good repair was practically nil. He generally handled such complaints with the explanation that the coal delivered was just as he had received it from the producer and he could do nothing about it. It was seen that such a condition must be corrected, and it was decided to make a very careful survey of some five thousand such complaints.

Plan of the Heating-Plant Survey

In order that the results of this survey would be of a nature permitting general application later, the following definite plan was arranged and strictly adhered to in every case investigated:

(1) The complaint must be from the consumer to the retailer delivering the coal.

(2) Investigations were not to be limited to one city or section, but carried on in all centers of the anthracite-consuming territories, as follows:

Portland, Me.
Boston, Mass. (Metropolitan area)
Providence, R. I.
New York City (Metropolitan area)
Philadelphia, Pa. (Metropolitan area)
Baltimore, Md.
Washington, D. C.
Albany, N. Y.
Syracuse, N. Y.
Rochester, N. Y.
Detroit, Mich.
Chicago, Ill.
Milwaukee, Wis.
Minneapolis, Minn.
St. Paul, Minn.

(3) All investigations were to be made by engineers representing the anthracite producers, in the presence of the customer and retailer who delivered the coal.

(4) Investigations were to be carried on until sufficint proof and cause of trouble would be to the mutual satisfaction of the three parties.

With very few exceptions there was a cooperative spirit with the customer, and the findings shown in Table 1 formed a real basis for the work of educating the dealer to qualify himself as a source of heat service, rather than be on the obsolete basis of operating merely as a source of supply. These investigations in the field also provided an excellent laboratory in which the consumer has assisted in no small way in the development of improved methods of utilization.

Of all the difficulties, 62% was due to faulty heating equipment, 56% of which was found to be caused by the condition of the chimney, flues leading from furnace to chimney, and soot lodged on the heating surfaces of the furnaces. This latter condition not only greatly reduced the thermal efficiency of the furnace but obstructed draft.

Very satisfactory progress to correct these conditions has been made all over the anthracite-consuming territory. This has been accomplished largely through educational methods, first from the service department of the anthracite industry to the coal dealer, and then from the coal dealer to the consumer. From the educational state it developed into a practical working plan of service which is quickly becoming a very important and economic feature in home heating, and there are now but few sections of the territory where such service is not available.

When the tonnage sold by a dealer so warrants, the individual dealer has established his own service department, and where dealers handle comparatively smaller tonnages, they have grouped into cooperative service organizations.

A practical example of the latter plan is that covering the operation in and around Elizabeth, New Jersey, where sixty-nine dealers are carrying on this service and maintenance work through a central office and in conjunction with a registered plumbing and heating contractor.

A representative example of this service and maintenance work being done by an individual company located in Brooklyn, N. Y., can be described as follows:

TABLE 1. FINDINGS OF DOMESTIC HEATING PLANT SURVEY BY ANTHRACITE COAL SERVICE

(Service Bureau of Anthracite Industry. Number of homes visited, 5000)

Classification		Causes	Occurrences	Per cent of total
1 Faulty equipment 62 per cent of total	(a)	Smokepipe, leaks, dirt, construction	1145	12
	(b)	Chimney, construction, obstructions, leaks, size	572	6
	(c)	Boilers and heaters, undersize, erection	668	7
	(d)	Soot on heating surfaces of boilers and furnaces	1526	16
	(e)	Oil in water, steam boilers	191	2
	(f)	Radiators, air-bound or otherwise obstructed	382	4
	(g)	Hot water and steam piping, layout, pitching, etc.	286	3
	(h)	Warm-air systems, general arrangement, including warm-air flues and cold-air supply	573	6
	(i)	Thermostats	191	2
	(j)	Grates	191	2
	(k)	Miscellaneous	191	2
2 Method of firing and general operation 36 per cent of total	(a)	Disturbing fuel bed	191	2
	(b)	Carrying fire at wrong depth	477	5
	(c)	Manipulation of dampers	1145	12
	(d)	Operation of grates	191	2
	(e)	Size of fuel being used	954	10
	(f)	Not maintaining proper water line in steam boilers	191	2
	(g)	Accumulation of ashes in ashpit	191	2
	(h)	Miscellaneous	95	1
3 Quality of coal 2 per cent of total	(a)	Excessive degradation	95	1
	(b)	Excessive slate and bone or other foreign matter	95	1
		Total number of occurrences	9541	100

All heating surfaces of the furnace are cleaned and scraped thoroughly by means of an electric vacuum machine. The flue leading from furnace to chimney is taken down, cleaned, and replaced after necessary repairs are made. The dampers are then checked over, water glass cleaned (if a steam boiler), asbestos covering repaired, and the general condition of the furnace checked over. If major repairs are necessary, a report as shown in Fig. 1 is left with the customer.

The cleaning and servicing operation is completed by white painting the asbestos covering of the furnace and black painting the doors, etc. A nominal charge is made for this work, and the net result has been valuable. After finding thousands of furnaces uncleaned for several years and in bad state of repair, the consumer has not only taken a new interest in the heating plant, but utilization is on a more efficient basis.

Until this class of work was first taken up by the coal dealer, it was always the heating contractor who was called in for such cleaning work, and there was some question about the coal dealer annexing this work. However, much cooperative work has been done in this respect, and the heating contractor now finds the coal dealer a source of maintenance and repair work which greatly overbalances any other prejudice.

Overloaded Furnaces

Next in order causing operating difficulties is that of overloaded furnaces or boilers. In drawing conclusions in any investigation it is the practice to see that all other conditions are right before stating that the boiler was of inadequate capacity. Too many overloaded boilers are in operation today, and as a matter of fact are still being installed. This is particularly true in connection with houses on large contract operations built largely for speculation, and where a few dollars saved in first cost is important to the contractor but very unfortunate for the ultimate purchaser. How to solve this problem completely is always one that promotes ready discussion.

Repair Recommendation Slip

Our Engineering Service Crew have completed Cleaning and Inspecting your Furnace and find the following Repairs Necessary:

_____

_____

_____

_____

We advise consulting your Plumber or Steamfitter at once.

If difficulty arises during the Burning season request our Free Advisory Service.

Signed_____

Date_____

HENRY HENJES, Inc.
COAL

BENsonhurst 0002-0003 Service Dept.

Fig. 1. Form for Recommended Repairs

It is at this point, as referred to before, that boiler-rating codes drawn up and adopted by the various societies and manufacturers associations become ineffective, and lead to the belief that a full realization of properly-selected equipment will not be present until the ultimate consumer is given more light on the subject.

An outstanding example of this was in connection with a group of 200 two-family houses involving the operation of 400 steam-heating boilers. The occupants of these houses had gone through two heating seasons under most unsatisfactory conditions when at a meeting of the owners they were told something about heating their homes. The meeting was arranged through a coal dealer supplying a majority of the fuel, and the facts given at the meeting were based on surveys made of a number of the heating plants which were installed uniformly in all the houses.

There were 320 sq. ft. of standing direct radiation, and an indirect hot-water supply coil which, with allowances for lines and risers, showed a total net load of 450 sq. ft. connected to a boiler which, under accepted codes, would not be installed to carry more than a 200 sq. ft. net load. With hot-water supply included, the annual anthracite requirements should not have been over 11½ net tons, but a survey showed an average of 14 net tons per boiler, representing an average excessive cost of $35 annually. To make matters worse, all of these boilers were connected to a 6 in. x 6 in. x 28 ft. chimney whereas the manufacturer specified a 10 in. x 10 in. x 35 ft. chimney.

First cost was undoubtedly responsible for this combination of conditions. The present owners were not in position to scrutinize the plans before erection, but it is reasonable to assume that fitting publicity and educational methods would show some way for a prospective purchaser of a home to know more about the heating plant he is about to acquire. When this is done one great handicap will be removed in that the speculative builder will be forced to give proper consideration to a very important part of the home.

Work has been done with some 6000 anthracite retail dealers, giving them facts on this phase of house-heating, and also urging them to make contact with prospective builders or owners of

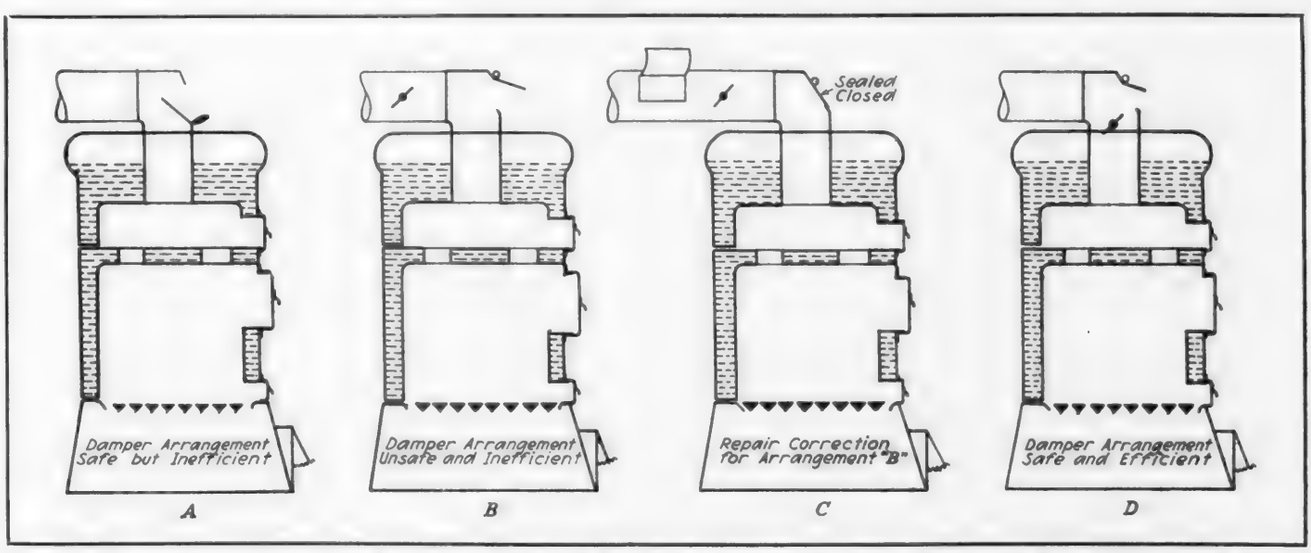


Fig. 2. Damper Arrangements. A—Counterweighted Combination Check and Flue Damper. B—Inefficient and Unsafe Arrangement. C—Check Damper Installed Between Flue Turn Damper and Chimney. D—Flue Damper Independent of Check Damper

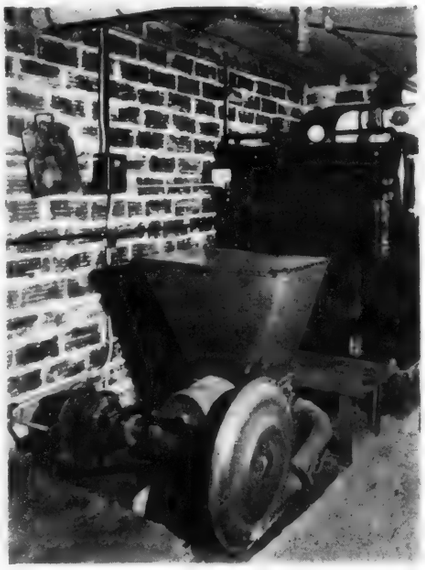
homes, giving them information on the subject. The rating code of the American Society of Heating and Ventilating Engineers and the National Boiler and Radiator Manufacturers' Code in Boiler Testing are fully subscribed to. Effective work is expected to be done by the Heating and Piping Contractors National Association with its certified heating campaign.

Arrangement of Dampers and their Control

From Table 1 it will be seen that 36% of the causes of unsatisfactory results was due to methods of firing and general operation. Damper control offered the most opportunities for observation and suggestions to consumers. In checking over damper arrangements offered by the numerous boiler manufacturers, a rather wide variance of ideas is found. Those engaging greatest attention during the survey are outlined in diagrams A and B in Fig. 2.

Diagram A shows a counterweighted combination check and flue damper which, while entirely safe from a gassing standpoint, is inefficient as a means to regulate draft. When the check damper is closed the fire is subjected to a full chimney draft regardless of the size of anthracite being burned. In many instances this condition causes unnecessarily overheated fuel beds, resulting in preventable chimney losses and clinkering.

Diagram B shows an arrangement which is not only inefficient but decidedly unsafe, and it was usually encountered when customers were complaining about "coal gas," especially at night after the fire had been banked. First, it is inefficient, as regulation or setting of the flue turn damper in any position other than wide open reduces the efficiency of the check damper in checking the rate of combustion when there is no demand for heat. Secondly, when the fire is banked at night it was found to be the rule to close the flue turn damper as well as opening the check damper, and this permitted the gases to pass from the fuel bed up through the furnace and then out into the basement through the open check damper. In all cases of this kind encountered it was urged that the check damper be sealed closed permanently and a new check damper installed between the flue turn damper and the chimney, as shown in diagram C.



Underfeed Stoker Applied to Jacketed Boiler

Diagram D outlines a damper arrangement which is efficient and safe, but is found in the minority. This gives independent flue turn damper control, and the check damper is in the correct relative location for efficient and safe checking of the fire.

It would be undoubtedly another step in the right direction if this principle of operation would act as a guide to a uniform type of damper gear furnished by boiler manufacturers. It lends itself to various adaptations, and should be considered as an integral part of the boiler or furnace as furnished by the manufacturer. All check dampers should provide a free opening of not less than 80% of the area of the flue leading from the boiler to the chimney. Check and turn dampers should not be designed to operate in tandem when a change of draft condition is required. This does not permit the regulation which is desirable for different sizes of anthracite.

It was found that better results were the rule where damper arrangements, as shown in diagram D, permitted operation of the flue turn damper independent from the check damper. The flue turn damper should be set to meet the draft requirements of the particular size of anthracite being used. The check damper should be used to start, or check, the draft to the furnace.

Battery of Underfeed Stokers in a Commercial Heating Installation

Practically all steam and water heating boilers are fitted with diaphragm or sylphon damper regulators which operate the check dampers in combination with the ashpit draft door; that is, when the regulator operates to check the fire, the ashpit draft door is closed and the check damper in the flue is opened.

Compare this plan of operation with that practiced in large steam boilers where natural-draft control is not obtained by opening or closing of ashpit doors. This point should be given consideration. To date, this has not been investigated in the laboratory, but experiments in the fie'd give considerable encouragement to the idea that improved and uniform damper arrangements between furnace and chimney, as shown in diagram D, would permit operation without the ashpit draft door and result in improved furnace operation.

This method of control is particularly beneficial when overloaded boilers are encountered in conjunction with clinker trouble. Forcing of the fire causes overheated fuel beds, and when the dampers finally operate, a sudden shutting off of air to the ashpit invariably results in ash fusion at the fuel and ash line. This formation of clinkers was practical'y eliminated by leaving the ashpit draft door open and limiting control to the other two dampers.

(Here follows a discussion of the selection of size of anthracite for use and an account of the investigations which have been conducted on this phase of the subject).

Thermostatic Control of Drafts

Much attention will be given to perfecting the utility of automatic draft controls which in turn will add greatly to convenience in the use of the larger sizes of anthracite in surface-fired boilers and furnaces. Investigations to date, however, indicate that damper design and arrangement will p'ay an important part in this work. It is understood that one large producer of thermostatic controls finds it necessary to make many changes of dampers when installations are made. This is particularly true where arrangements outlined in diagrams A and B in Fig. 2 are encountered. The usual correction is outlined in diagram C.

Ash Removal

Development of equipment or systems to reduce to a minimum or to eliminate completely the necessity of ash removal by the householder is receiving serious attention. The goal is a practical system by which the ash and refuse will be removed from the premises without any labor whatsoever on the part of the consumer.

Vacuum ash removal bids fair to meet this requirement and progress is being made. Such a system for removing ashes from the boiler operating in a large apartment house was inspected recently. This equipment is really a portable adaptation of the standard vacuum ash-removal idea, being entirely self-contained on a large motor truck chassis fitted with pneumatic tires. A gas-electric set provides power for the operation of the exhauster blower, also for the belt conveyor which discharges the ashes from the truck hopper to the standard ash truck. An 8-in. universal-joint fitting connects the blower intake line to a standard 8-in. pipe running from sidewalk level to the boiler room. The advantages of such a system are readily appreciated when compared with the common present-day procedure requiring ashcans, ash hoists, general upkeep, and the attendant noise and dust.

It is proposed to design smaller units of this system which will make it adaptable for service to the domestic consumer. This is an excellent prospect to make manual ash removal a thing of the past in that it will be entirely practical to have ashes removed directly from the ashpit of the furnace to the service truck.

How the Field for Insulating Board Is Expanding

Until a few years ago building insulation was a more or less indefinite subject. A few architects and builders were experimenting with insulation on some of their larger jobs where money was of secondary consideration. These were mostly custom-built jobs where the client wanted the best the architect and builder could supply. Insulation at this stage of the game was in the category of an "auxiliary" material, and as such greatly increased the cost of any building job. Naturally this state of affairs prevented a wide or extensive development of insulation. It was accepted as worth while and even desirable if the money was available, but since architects and builders were researching along the lines of economy, only slight attention was devoted to insulation.

Manufacturing developments among the insulation board manufacturers have changed this attitude toward the entire question of structural insulation. Insulating board is now constructed so that it has structural strength in addition to high insulating efficiency.

Some types are really stronger than ordinary wood sheathing,—are an excellent plaster base, hold nails, and are moisture resisting. These qualities enable insulating board, in many cases, to displace other building material without reducing the structural strength of the job, at the same time providing effective insulation. In other words an insulated job need cost no more than the modern uninsulated one.

Insulating board has also received the attention of the fuel companies. A large metropolitan gas company, desirous of bringing the convenience of gas heating within the reach of the average pocketbook, has been experimenting quite intensively with insulating board.

This company constructed a medium-sized residence in a suburban development. This house was exactly like its neighbors except for the fact it was completely insulated and gas heating was installed in contrast to the coal-consuming equipment of the other homes. Careful records were kept throughout the year. A check-up showed that the gas-heated house was heated as economically as the others when ash-handling and furnace-maintenance costs were taken into consideration.

In the industrial field the question of roof insulation has received considerable attention. With the expansion of the South industrially, summer heat has presented itself as a real problem. Unless workers are kept comfortable and protected from temperature extremes, serious inroads are made into the general efficiency and morale. Without insulation it is necessary to build industrial establishments with plenty of dead air space under the roof. However, this type of construction is more costly than straight flat-roof construction.

By using insulating board, flat-roof construction is both possible and practical. Working conditions are improved, and decided economies in production justify this type of construction even if it were more expensive.

Cornstalk Gas for Heating

Cornstalk gas to light and heat small cities was announced at the recent meeting of the American Chemical Society in Minneapolis. Ordinary sewage and cornstalks are combined in a cheap, simple method which, it is stated, produces a fuel consisting of methane gas and plain marsh gas.

University of Illinois chemists, including Dr. A. M. Buswell, professor of Sanitary Chemistry, and C. S. Boruff, are credited with the discovery of the new method. The crux of the Illinois discovery is quantity production of cornstalk methane. This process is not new, but heretofore it has not been possible to procure enough methane to make it valuable. Keeping out the oxygen, was found to be the key to the problem.

Anthracite Club Hails Automatic Heating with Coal

R. V. FROST, of the Frost Research Laboratory, Norristown, Pa., was the principal speaker at the monthly meeting of the newly organized Anthracite Club, held in the private dining room of the J. C. Penney Co., New York, September 16. Oscar F. Ostby, president of the club, and vice-president of the Domestic Stoker Co., New York, occupied the chair.

Mr. Frost opened his address by quoting an editorial on the domestic coal situation from HEATING AND VENTILATING for September. He said in part:

"As an introduction to my talk I will quote from an editorial in the September issue of HEATING AND VENTILATING. There is also in this issue an article upon the work of our laboratory now under way for the anthracite industry, which contains several illustrations that may be of interest to you:

" 'After more than one false start King Coal at last has entered the lists in the Battle of the Fuels in a way that promises a real "hoss race." During the early ascendancy of gas and oil the coal interests spent their major effort in a campaign of detraction. At the time HEATING AND VENTILATING editorialized on the futility of the negative campaign adopted by the coal interests and urged the inauguration of one based on the acknowledged merits of coal.

" 'Meanwhile, oil and gas continued to grow in popular favor. The climax was reached when the smarter dealers, some of whom had been most vehement in their denunciation of oil, came out with announcements that they were prepared to supply oil fuel on demand.

" 'From that point the situation developed rapidly. During the last three years various groups representing the anthracite coal interests have joined forces with groups interested in the production and sale of anthracite-burning equipment, to restore coal to its place in the sun.'

"From here the editorial continues with mention of the subsidiaries of the Anthracite Operators' Conference, the Anthracite Coal Service and Anthracite Bureau of Information, also making mention of the experimental work now under way for the conference in our laboratory, and quoting again:

" 'Finally, the Anthracite Equipment Corporation has been formed by the same interests to use the information and data obtained from the laboratory to finance and develop merchandising outlets for stoker and other coal-burning appliances.

"It is evident that, with its new set-up, the Anthracite Operators' Conference is prepared to do an effective job for anthracite coal which should go far towards restoring it to public favor. Thanks to recent developments in the field of domestic stokers, the coal industry now is nearer than it has ever been to the achievement of Automatic Heat, and it is safe to say that the industry will use this trump card for all it is worth.'

"The last statement in this editorial I wish to bring to your attention tonight. Automatic heat is most emphatically the anthracite industry's trump card and it is most assuredly safe to say that the industry will use this trump card for all it is worth.

Anthracite Industry Again Passing Through Period of Experimentation

"All industries," continued Mr. Frost, "are said to pass through three stages or periods in their development. First, experimentation; second, exploitation; third, stabilization. One might suppose that an industry nearly a century old, as is the anthracite industry, had reached the age of stabilization, but apparently not, for it is again passing through an experimental period that seems destined to have a far-reaching effect.

"Likewise in the heating industry. For thirty-five years there was scarcely a change, and now for the past five years changes have come so rapidly and have been so upsetting that we are bewildered and it is hard to guess what change will come next.

"The two industries, anthracite and heating, have been affected by the same basic factor and one that leads us straight back to the demand for automatic heat. I use the word anthracite as distinguished from other coals, for the reason that anthracite is essentially a domestic fuel and therefore is closely related in its commercial aspects to the heating industry.

"When the furnace or boiler was put in the cellar near the coal bin, it was thought to be the last word in ease, until everybody began to kick against lugging ashes up out of the cellar. The drudgery of lugging ashes gave the oil and gas salesmen their clue. They hopped right into the center of the stage, and to judge from the statements of over-enthusiastic oil-burner salesmen, counted upon being the whole show.

"They expected to drive King Coal out of the picture entirely, but King Coal did not accept retirement so readily, and now we have the Battle of the Fuels, as the editor of HEATING AND VENTILATING calls it—and it does look like a real 'hoss race.'

"Neither an oil burner nor a gas burner is in itself automatic. It can only be made automatic by means of controls, and as a matter of fact, neither oil nor gas can be as easily controlled as can anthracite. We had perfectly satisfactory controls for coal fires twenty years ago, but they were regarded as a luxury.

"The anthracite industry has been a victim of its own conservatism, but such a state is to be expected since for over a period of thirty-five years surface-burning, domestic-heating furnaces and boilers using anthracite had developed to a remarkable degree, and were considered highly satisfactory.

"If any criticism can be made against the industry, it is for lack of foresight of the impending condition. In this machine age, if anything can be done by machinery now done by hand, then conditions must be altered to meet the new demand. The anthracite industry did not recognize this.

"People refuse to shovel coal and lug ashes, and so we are now entering the age of automatic heat. Automatic heat implies not only automatic control but the elimination of all hand attention. So to meet these new conditions as they apply to coal-fired heating plants, coal must be handled from the bins to the boiler and ashes removed to a receptacle outside the building by the mere pressing of a button.

"Stokers as they are built for domestic heating today, do not meet the need. They are merely links in a method of control, and except for burning a cheaper coal, they accomplish but little towards automatic heat, and fail to meet the competition of oil and gas. The labor of shoveling coal and ashes remain.

"I do not mean to detract from the value of present-day stokers. They are a step in the right direction, but until there is added the means to handle coal and ashes automatically they will not meet the requirements.

"You may ask how will you handle coal and ashes automatically? I reply, the solution of this problem is nearer than you may surmise and it is destined, I believe, to transform the anthracite industry.

"You who have followed the development of the domestic stoker have observed that all stokers without exception use the smaller sizes of coal. Why? And you will answer because the smaller sizes are cheaper. Yes, on the surface, that is the answer, but the more fundamental reason is because the smaller coal is so much easier to use in a stoker. Stokers could not be built to sell for a few hundred dollars if they were designed for the larger sizes. Therefore stoker development will continue along the line of utilizing the small sizes of coal, and, of course, you know the effect it will have upon the industry. As stokers become more widely used, the demand for the smaller sizes of coal gradually will increase until this demand controls the market price.

"There is great conjecture on how anthracite will eventually be prepared. Some think it will eventually be gasified, others that it will be pulverized and sold in air tight containers. One guess is as good as another but, as I see the trend in stoker development, I look upon it to continue to be sold in bulk, but that the major portion will be prepared in very small sizes—not pulverized, but perhaps as small as river coal and very pure—the percentage of ash much less than 10%.

"In that event I see this picture of the future, perhaps ten or fifteen years from now.

"Coal will be delivered to the consumer in closed, steel hopper bottomed trucks, which will be fitted with suction apparatus. The consumer's bin will be an air-tight steel tank fitted with a 4-in. hose connection and vent pipe. The dealer's truck will be connected to the bin with a flexible hose and the coal will be blown from the truck to the bin without a trace of dust or other annoyance.

"The consumer's bin will be so located that it can feed by gravity to the stoker or it will be equipped like the truck with a blower to blow the fuel from the bin to a closed hopper on the stoker. As the ashes accumulate in a receptacle under the stoker they will, by their own weight, cause an electrical contact to be closed and set in motion a suction blower that will blow the ash like the coal from the ash receptacle to a larger container outside the building from which it may be removed periodically. You may ask what about the dust from the ash. This has been handled satisfactorily in the handling of other dust-laden materials by the blower system and can, of course, be handled in this case.

"You may say this is a visionary idea but I can assure you it is not. Every step mentioned has been worked out to a practical solution and merely requires the confidence of capital to make the development of commercial value.

"A word regarding the preparation of coal to the very fine size mentioned. Preparation of the great bulk of coal to a minimum size for use on automatically-controlled and fed stokers would eliminate the wastage and difficulty, now caused by segregation and disintegration, and would make marketable a large percentage of coal for which there is now but small demand. In fact all coal mined could be marketed on an equitable cost basis and the cost for grinding equipment would be offset by the reduction in cost now resulting from the separation of sizes.

"You may counter with this claim. To design stokers for the very fine sizes is difficult and would scrap all the present designs. But to answer your claim I can say that ten years from now the majority of stokers will be superseded by other designs, and I can also say that there are stokers now built that with but minor changes will burn the very fine size with greater success than they now burn buckwheat.

"So much for the future. Let me say just a word upon the immediate needs. Fast as we think stokers are developing they are not keeping pace with the public demand.

"Since it has become publicly known that we are working at our laboratory on the development of stokers, hardly a day passes that we do not have several inquiries on stoker equipment. Of these, there have been a very large number asking us to recommend stokers with ash-removal facilities to handle loads of 10,000 sq. ft. steam radiation. Look the field over and name them yourself. I know of only one that meets that requirement and that one is hardly a year old. Stoker manufacturers should develop this field. In fact there are all too few real good stokers of any size. If some big manufacturer with a sales organization would tackle the field and turn out a practical line, he would find an enormous market waiting for him.

"Anthracite is far more adaptable to automatic regulation than either oil or gas, as the machinery required for its regulation is so much simpler. A stoker can be built that will require very little servicing and which will run for years without renewal of parts.

"Anthracite has the advantage of a steadier control. Heat can be generated at a uniform rate without the uncomfortable up and down movement of temperature so noticeable with gas or oil. Anthracite therefore has far better chances of becoming the ideal fuel to produce that balmy June atmosphere now demanded upon a zero day in January."

Mr. Frost's address evoked a spirited discussion, the speakers included Caleb Kenney, of Western Dodson & Company; Judge E. W. Parker, director of the Anthracite Bureau of Information in Philadelphia; F. J. Wadleigh, who was U. S. Fuel Administrator during 1921-22; Theodore F. Maerker, of the Lehigh Coal and Navigation Company; Cliff W. Presdee, advertising manager of HEATING AND VENTILATING, and M. E. Durkee, manager of the Certified Heating Bureau of the Heating and Piping Contractors New York City Association.

A.S.M.E. to Celebrate Fiftieth Anniversary

Tentative plans have been made that five days, April 5-9, 1930, will be given over to a celebration of the fiftieth anniversary of the American Society of Mechanical Engineers. Ceremonies will be international in scope, and will record the achievements of the society for the past fifty years, evaluate the influence of mechanical engineering upon the economic life of the country, and point the way to future development.

The preliminary meeting of the society was held February 16, 1880, in the office of the *American Machinist*. It is expected that the proceedings of the celebration will open with a visit to the present office of the *American Machinist*, where appropriate programs will be held.

The Society was organized April 7, 1880, in the auditorium of the Stevens Institute of Technology, which is preparing an elaborate pageant to depict the early life of the society. The final three days of the celebration will be held in Washington, D. C.

Virginia Contractors Establish Fellowship

A graduate fellowship in the School of Engineering of the Virginia Polytechnic Institute has been established by the Virginia Associated Plumbing and Heating Contractors, Inc. Applications are invited from graduates of any recognized engineering college who may be interested in the heating and plumbing industry, and who wish by such research and study to fit themselves for permanent business or executive positions which are likely to be available on the completion of the work.

Letters of application, with a transcript of the applicant's college record, should be addressed to Earle B. Norris, dean of engineering, Virginia Polytechnic Institute, Blacksburg, Va.

Heating Contractors in National Merger

ONE of the most significant moves ever taken in the heating contracting industry is the formation of the Wells-Newton National Corporation, a consolidation of some 34 companies throughout the country, engaged in heating, ventilating, plumbing and fire extinguisher work. Headquarters of the new corporation will be at 103 Park Ave., New York. Prominent among the advantages anticipated from the merger is a unified control, covering sales, purchasing power, engineering, estimating, fabrication and standardization. Most of the companies involved already carry large stocks incidental to their business, and purchasing from the manufacturers, it is expected, will have an important effect in promoting the success of the corporation.

The Wells and Newton Company, Inc., New York, which is the nucleus of the new company, has been in existence since 1890, and is in itself a consolidation of six companies. It is now further expanded by entering into a consolidation with other successfully operating companies located in various parts of the United States. The complete list is as follows:

Beldon-Porter Co., Minneapolis, Minn.
R. C. Beverley Heating Co., Richmond, Va.
James J. Bresnahan, Inc., Buffalo, N. Y.
W. A. Bywater Co., Salt Lake City, Utah.
Crowley Brothers, Peoria, Ill.
Thomas L. Dawson & Co., Kansas City, Mo.
A. J. Eckert Co., Albany, N. Y.
Farrell Heating & Plumbing Co., Atlanta, Ga.
J. A. Gallivan, Inc., Muncie, Mich.
Gowans-Hailey Co., Nashville, Tenn.
John Graham Plumbing & Heating Co., Pittsburgh, Pa.
The William Haas Co., Dayton, O.
Hamilton Brothers Co., Gulfport, Miss.
Healy Plumbing and Heating Co., St. Paul, Minn.
William F. Hildeman, Chicago Heights, Ill.
Johnson Brothers Plumbing & Heating Co , Champaign, Ill.
The William Kirk Co., Bridgeport, Conn.
Frank B. Lasette, Inc., New York.
Luppen & Hawley, Sacramento, Calif.
McAuliffe Plumbing and Heating Co., Indiana Harbar, Ind.
Martyn Brothers, Inc., Dallas, Texas.
Lloyd E. Mitchell, Inc., Baltimore, Md.
Nilson Brothers, Chicago, Ill.
O'Mara & Stewart, San Francisco, Calif.
Reed Brothers, San Diego, Calif.
H. P. Reger & Company, Chicago, Ill.
A. G. Rose, Inc., New Orleans, La.
A. H Shafer, San Antonio, Texas.
John J Shanahan, Norfolk, Va.
Shank-Coupland-Long Co., Inc., Flint, Mich
J. Sheehan Plumbing Co., St. Louis, Mo.
John J. Vogelpohl Co., Cincinnati, O.
Wells & Newton Co., Inc., New York.

All of these are old-established companies. No change will be made in their management and control except that the head of each unit or division will become a director or officer of the corporation but he will remain in active charge of his division of the business.

Frank J. Fee, of New York, has been made president of the Wells-Newton National Corporation. Other officers are: Vice-presidents, Frank B. Lasette, John J. Vogelpohl, Henry P. Reger, Jere Sheehan, J. Edward Evans and James J. Bresnahan; treaturer, Frank B. Lasette; secretary, William Haas, Regional vice-presidents: Andrew Nilson, Chicago; Daniel A. Farrell, Atlanta, and Henry J. Martyn, Dallas. Executive committee: L. L. Harr, chairman; Frank J. Fee, Frank B. Lasette, H. P. Reger, Daniel A. Farrell, John J. Vogelpohl, Jere Sheehan, Henry J. Martyn, Andrew Nilson, William Haas and James J. Bresnahan.

Operating committees: Frank B. Lasette, director of estimate, engineering and construction; John J. Vogelpohl, director of advertising, sales and publicity; James J. Bresnahan, director of purchases; J. Edward Evans, director of maintenance, manufacturing, factories and warehouses, and L. L. Harr, director of finance. The directors consist of the above and R. Carter Beverley, W. A. Bywater, William A. Crowley, Albion J. Eckert, Jerry A. Gallivan, John W. Gowans, John Graham, Robert R. Hamilton, John A. Healy, William F. Hildeman, Dick Johnson, William P. Kirk, Frank B. Long, Luppe B. Luppen, Henry McAuliffe, George W. Mitchell, J. E. O'Mara, H. Merwin Porter, A. O. Reed, A. G. Rose, Walter P. Shafer and John J. Shanahan.

In the financial set-up of the Wells-Newton National Corporation 50,000 units of stock consisting of one share of $4 cumulative convertible preferred stock and one-half share common stock represented by voting trust certificates (no par value) are being offered for sale. This makes the total issue 50,000 shares of preferred stock and 250,000 shares of common stock. The units are being offered at $70 each and accrued dividends.

As the corporation begins business its consolidated balance sheet shows current and working assets of approximately $4,878,000,000, of which cash and negotiable securities total $1,108,146.11. The current liabilities are $1,610,900 leaving current net assets of $3,267,100 or $65.35 per share on the preferred stock. Net tangible assets as of December 31, 1928, after giving effect to the present financing, were $4,564,500 or $91.29 per share on the $4 cumulative convertible preferred stock. The ratio of current assets to current liabilities is over 3 to 1.

Consolidated annual net earnings of the 34 companies involved in the merger, for the three years ending December 31, 1928, after the elimination of certain non-recurring charges for each year and after deducting Federal income taxes, are shown as follows:

	Gross Income	Net Income After Taxes
1926	$10,489.287.23	$541,584.42
1927	10,971,686.98	713,398.44
1928	10,839,320.15	837,306.37

U. S. Produces Nearly a Million Tons of Briquets

Because of its abundant supplies of high grade coal, the United States contributes but a small part of the world output of fuel briquets, according to a recent report issued by the United States Bureau of Mines. The coal briquetting industry has attained its greatest development in countries where a large part of the available coal is of low grade and is unsuitable for use in its raw state. Germany produces 87% of the world output of this type of fuel.

In this country a total of 940,806 net tons of raw fuel of all kinds was briquetted in 1928. It is of interest that "river coal" dredged from streams which drain the Pennsylvania anthracite region, supplied all of the raw fuel for two briquet works and was used in combination with other raw coal by a third plant.

Arrangement for Ventilating Upper Berths of Golden State Limited

Tapp Made Managing Director of American Oil Burner Association

Harry F. Tapp, Managing Director of the A.O.B.A. and Director of the Oil Heating Institute

THE resignation is announced of Trell W. Yocum, managing director of the A.O.B.A. and of the Oil Heating Institute, effective October 1. E. Earl Newsom, assistant director of the Oil Heating Institute, also has resigned and has become connected with the John Day Company, publishers, of New York.

Harry F. Tapp, technologist of the association, succeeds Mr. Yocum as managing director of the association and director of the Oil Heating Institute.

Mr. Tapp is a native of Quincy, Ill. where he was born in 1896. He studied mechanical engineering at the Pratt Institute in Brooklyn. During the war he served as an ensign in the U. S. Naval Reserve Force on the U. S. S. Kansas. He became connected with the oil-burner industry as engineer in the Research Department of the Socony Burner Corporation. Mr. Tapp was appointed technologist of the A.O.B.A., in 1927.

Further announcements regarding the association's plans under the new arrangement it is expected, will be made following the forthcoming meeting of the association's board of directors, October 23.

Speakers' Bureau for Oil Heating Institute

A speakers' bureau is being organized by the Oil Heating Institute to cooperate with the various national and sectional groups of the heating industry, engineering societies and electrical specialty groups in providing speakers for civic organizations, such as the Rotary and Kiwanis Clubs, with the purpose of bringing before the meetings of such organizations a discussion of subjects pertinent to the oil-burner industry.

A. O. B. A. 1930 Convention to Be Held in Chicago

American Oil Burner Association has scheduled its seventh annual convention to begin Monday, April 7, at the Hotel Stevens, in Chicago. Activities will be held throughout the week and full details of the plans will be announced later.

Chicago Oil Burner Association

Forty-nine members and guests attended the September meeting of the Chicago Oil Burner Association, held September 10 at the Hotel Maryland, Chicago.

The most important action taken at the meeting was the adoption of a resolution for the Chicago Oil Burner Association to join the American Oil Burner Association as a unit, and that the active members of the Chicago Oil Burner Association join the American Oil Burner Association as dealer members.

Irwin D. Groak reported the need for a representation of the association to confer with the Chicago Enforcement Office of the Smoke Inspection Bureau. Mr. Groak was requested to submit a statement of facts to the chairman of the association's Ordinance and Standardization Committee.

A number of revisions in the association's constitution and bylaws were adopted, one of which provided for an increase in dues to $100 a year.

B. K. Eaton and H. A. Adams were elected to membership on the board of directors.

F. J. Moore, for the Burning Oil Distributors' Association, reported on the activities of that body, and found a ready response to his suggestion of cooperation and coordination between the two associations. Following his remarks, President McCormack stated that later he would announce the members of a committee to meet with a representation of the Burning Oil Distributors' Association.

Petro Holds First International Convention

In Stamford, Conn., August 12-14, 1200 dealers and members of dealer organizations met for the first international sales convention of the Petroleum Heat and Power Company. The first day was devoted exclusively to the Nokol division of the company. The second day was given to both Nokol and Petro divisions, and the last day exclusively to the Petro division.

Industry Adopts Rules on Business Conduct

OFFICIAL action on twelve rules of business conduct, adopted at a trade practice conference of the heating and plumbing industry held in Pittsburgh last May, is announced by the Federal Trade Commission. Seven of the rules are approved as applicable to unfair methods of competition, while the remaining five are accepted as expressions of the industry. Five rules proposed by the industry were rejected, while several others were amended.

It was estimated that the 367 firms present represented 80% of the industry. Commissioner Charles H. March of the Federal Trade Commission presided. He called particular attention to the work of the Trade Practice Conference Division, stating, among other things, that these gatherings were purely voluntary on the part of the industries, and that the success or lack of success of any conference was in direct proportion to the cooperative efforts put forth by the members of the industry for which the conference was held. The commissioner expressed the view that there had been no single industry for which a trade practice conference had been held which had not experienced material benefit as a result of same.

Commissioner March emphasized the fact that the government did not wish to extend its field of operation into matters which concerned primarily the business world.

Another subject of interest which was well received is what was referred to as a change of policy in featuring and encouraging the trade practice conference work, which deals with an industry as a unit, permitting all members voluntarily to eliminate unfair methods of competition at one and the same time whenever this can be done, rather than through the compulsory process of issuing and trying complaints against individual respondents.

Rules appearing under Group 1 are approved affirmatively. Those appearing under Group 2 are accepted as expressions of the industry:

GROUP I

Rule 1. Inducing or attempting to induce the breach of a contract between a competitor and his customer during the term of such contract, is an unfair method of competition. Provided, that nothing in this rule shall be taken to prevent a party who has quoted on the material involved from calling to the attention of the purchaser, even though order has been placed, that the list of materials for which order has been placed does not conform in quantity or quality to the list on which the interested party has quoted.

Rule 2. Marking or branding of products in the plumbing and heating industry should be done in every instance possible, but such marking, branding, or failure to brand, done for the purpose or with the effect of misleading or deceiving purchasers, or prospective purchasers with respect to the quantity, quality, size, grade or substance of the product purchased, is an unfair trade practice.

Rule 3. Selling or offering to sell any product of the plumbing and heating industry with intent to deceive purchasers or prospective purchasers as to the quantity, quality, size, grade or substance of such product, is an unfair trade practice.

Rule 4. Discrimination in price of plumbing and heating products between purchasers of the same class, not including discrimination in price on account of the difference in grade, quantity or quality of the products sold, or which makes only due allowance for difference in cost of selling and transportation or discrimination in price in the same or different communities not made in good faith to meet competition, where the effect of such discrimination may be substantially to lessen competition or tend to create a monopoly, is an unfair trade practice. Provided, however, that nothing in this rule shall be construed to prevent the publication and use of a special quantity price applicable to a definite quantity of goods which are placed in one order and at the option of the shipper or moved as one shipment; And, provided further, That nothing herein contained shall prevent persons, firms or corporations engaged in selling plumbing, heating and other products in commerce from selecting their own customers in bona fide transactions.

Rule 5. The acceptance of orders for large quantities of plumbing and heating products by manufacturers or wholesalers, except for a specific building operation, and then making small deliveries at quantity prices for the purpose and with the effect of discriminating between different purchasers, is an unfair trade practice.

Rule 6. Withholding from, or inserting in the invoice, facts which make the invoice a false record, wholly or in part, of the transaction represented on the face thereof, and, or the payment or allowance of secret rebates, refunds, credits, unearned discounts, whether in the form of money or otherwise, or the extension to certain purchasers of services or privileges not extended to all purchasers under like terms and conditions, is an unfair trade practice.

Rule 7. Selling plumbing and heating products below cost for the purpose of injuring a competitor or for the effect of lessening competition, is an unfair trade practice.

GROUP II

Rule 8. The variable practice on the part of sellers of requiring purchasers in some instances to pay cartage charges and in other instances of assuming such charges causes unfair discrimination. Therefore, the failure of manufacturers and, or wholesalers of plumbing and heating products to require the purchaser to pay the published charge for cartage is condemned by the industry.

Rule 9. Quoting a total price on any schedule of plumbing and heating products which does not show unit prices generally conceals confidental preferentials and results, in many instances, in fraud in the substitution of products of inferior quality, grade, style or size, which is detrimental to the interest of the public and the industry and any addition or deduction on any other basis than the unit price shown is price discrimination and is condemned by the industry.

Rule 10. Contracts, either written or oral, are business obligations which should be performed in letter and in spirit. The repudiation of contracts by sellers on a rising market, or by buyers on a declining market, is equally reprehensible. Such action shatters confidence, induces violent fluctuations in price, destroys stability in business operations to the consequent injury of the industry as well as the general public, and is condemned by the industry. Contracts should be subject to no cancellation except for legal cause or by mutual consent.

Rule 11. Post-dating or pre-dating a contract or making a contract without authorization and definite commitment at the time it is made, by both parties thereto, is condemned by the industry.

Rule 12. When wholesalers quote prices on products for a specific building operation and include a clause which provides for the acceptance of such prices within a specified time, allowing the quotation to remain in effect after the date of acceptance without making a fair and equitable adjustment in prices in the event of a general decline or general advance of the market, is an unsound method of business and is condemned by the industry.

American Society of Heating and Ventilating Engineers

National Importance of Heating and Ventilating to Be Emphasized at International Exposition

The great national importance of heating and ventilating to modern life and the absolute dependability of every character of building upon these two factors, will be the key-note of the First International Heating and Ventilating Exposition, to be held in Philadelphia, January 27-31, 1930, at the Commercial Museum, during the annual meeting of the American Society of Heating and Ventilating Engineers.

As is well known, many interests outside those directly connected with the heating and ventilating field are taking steps to share in the advancement of the art. For instance, the electrical interests are experimenting in the field of house-heating; room cooling units are an accomplished fact, oil and gas interests are vying with each other to improve their status, while in the coal industry, rapid strides are being made in the direction of automatic heat from coal.

All of these interests will be represented at the Heating and Ventilating Exposition, and all of these subjects will bring to the show exhibits beneficial alike to heating and ventilating engineers, architects, contractors, building owners and managers, home-owners, builders and those allied with the building industry.

Products which will be shown, as indicated by reservations already made, include every type used in heating and ventilating work, both in the individual home and industrial plants. Some idea of the diversity of exhibits is given in the list which includes refractories, insulating materials, blowers, fans, air-conditioning and humidifying equipment, pipe and piping systems, pipe fittings, unit heaters and a wide variety of control and regulating apparatus and instruments.

President Thornton Lewis of the American Society of Heating and Ventilating Engineers, under whose auspices the exposition is to be held, has named the following exposition committees:

Advisory Committee: H. P. Gant, chairman, York Heating and Ventilating Corp.; A. S. Armagnac, HEATING AND VENTILATING; D. S. Boyden, Edison Electric Illuminating Co., Boston; W. H. Carrier, Carrier Engineering Corp.; A. C. Edgar, Certified Heating Association, Inc.; Roswell Farnham, Buffalo Forge Co.; C. V. Haynes, Hoffman Specialty Co.; E. B. Langenberg, Langenberg Mfg. Co.; J. I. Lyle, Carrier Engineering Corp.; F. J. McIntire, United States Radiator Corp., H. C. Murphy, Reed Air Filter Co.; F. R. Still, American Blower Co.; E. K. Webster, Warren Webster & Co., and H. L. Whitelaw, American Gas Products Co.

Co-operating Committee: O. H. Fogg, president, American Gas Association; C. H. Hammond, president, American Institute of Architects; E. M. Fleischmann, president, American Oil Burner Association; A. J. Wood, president, American Society of Refrigerating Engineers; Walter Klie, president, Heating and Piping Contractors National Association; H. T. Richardson, president, National Boiler and Radiator Manufacturers' Association; John W. Meyer, president, National District Heating Association; W. C. Hanson, president, National Pipe and Supplies Association; C. E. Hall, director, National Warm Air Heating Association, and R. T. Creviston, manager, Plumbing and Heating Industries Bureau.

Charles F. Roth, with offices in the Grand Central Palace, New York City, is manager of the exposition.

British Members Entertain President Lewis

Members of the American Society of Heating and Ventilating Engineers, in England, under the leadership of W. Nelson Haden, of Trowbridge, entertained President Thornton Lewis at a dinner in London, July 18, where the officers and council of the Institution of Heating and Ventilating Engineers of Great Britain were guests.

Presidents of British and American Heating Engineers Meet. (left) J. Roger Preston, and (right) Thornton Lewis

Mr. Haden was toastmaster and President Lewis presented J. Roger Preston, president of the British Institute, with an engrossed resolution greeting from the A. S. H. V. E., adopted at the summer meeting which was held in Canada in June.

President Lewis, in reply to a toast by Mr. Preston, told of the trends in heating and ventilating in the United States. The recent bulletin from Mr. Preston, to members of the British Institution, stated that in large places of assemblage developments in both England and the United States are similar, but in general heating practice in the States there is a greater tendency to use indirect and concealed radiation, while the trend in England is to utilize as much direct radiation as possible with less regard for air temperature.

During his visit, Mr. Lewis was escorted by Mr. Preston to the Building Research Station at Watford, where Messrs. Barrett and Dufton demonstrated the work that is being done by the British Government in collaboration with the Institution of Heating and Ventilating Engineers.

New York Chapter to Open Fall Season October 21

A talk on "Certified Heating in New York City" will feature the opening meeting for the season of the New York Chapter, to be held at the Building Trades Club, 2 Park Avenue, Monday evening, October 21. William E. Taylor, executive secretary of the H. & P. C. New York City Association, will be the principal speaker.

President E. J. Ritchie, of the New York Chapter, has made the following committee appointments: Program, A. S. Armagnac, chairman, Russell Donnelly and L. M. Ralston; attendance, Russell Donnelly, chairman; membership, Rudolph Kuhlmann; nominating, R. H. Carpenter; entertainment, A. Engle.

Chicago Association Elects Officers

New officers of the Chicago Master Steamfitters' Association, elected at its last annual meeting, are:

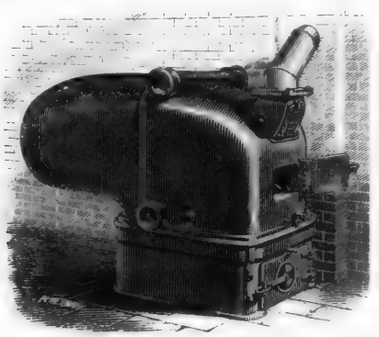
President, Neil J. Dougherty; vice-president, J. P. Baldwin; treasurer, George Mehring; secretary, W. V. Hoier. Directors: J. N. Hansen and R. D. Berry. Arbitration committee: G. M. Getschow, T. I. Magan, W. A. Pope and F. C. Blank. Alternates: W. F. Thumm and W. J. Gemeny.

Glancing Backward

XVI. Burnham Boiler Corporation

ALTHOUGH the developments of the house-heating boiler are as interesting as those of the radio and electric light, the pioneers in boiler design have seldom been recognized.

The Burnham Boiler Corporation, as now constituted, is the result of the combination, in 1907, of two of the oldest boiler companies. Its history is the



Corrugated Firebox Boiler Formerly Made by Hitchings & Company

combined history of these two concerns and its story is that of pioneers in boiler making for home-heating. One of the firms, the older, was Hitchings and Company, the name of which survives in that of the greenhouse builders in Elizabeth, N. J. The other was the boiler division of the Lord and Burnham Co., of Irvington, N. Y.

When Hitchings and Company was founded in 1844, central house-heating plant, as we know them, were almost non-existent. Hitchings' first recorded patents were for a conical boiler, an adaptation of the tubular marine type in which the tubes were set vertically. The patents for this boiler were dated 1857.

In the earliest available catalogs of this company we find illustrations of the conical boiler and also those of the Mogul boiler in which fire tubes were introduced much as in the present steel tubular boilers. These Moguls, however, were of cast-iron rather than steel.

Mogul boilers seem to have been an adaptation of the type called the corrugated firebox boilers, a steel boiler which incorporated both the corrugated heating surface and long fire travel featured in the Burnham Boilers of today.

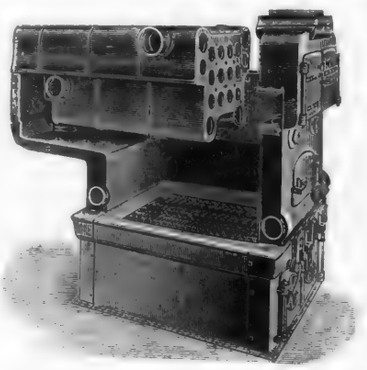
Hitchings & Company was founded, in 1844, by A. E. Hitchings and Willard Harding King, for the manufacture of hot water boilers. In 1907, the New York factory of this company was moved to Jersey City and later to Elizabeth, N. J., where one factory of the Burnham Boiler Corporation is still located.

Patents for the corrugated firebox type boiler were granted in 1867; this seems to have been the forerunner of all cast-iron boilers with return flues. Other models were patented in 1873, about the time the Mogul was introduced, the latter being perhaps the earliest boiler to use cast iron push-nipple connection.

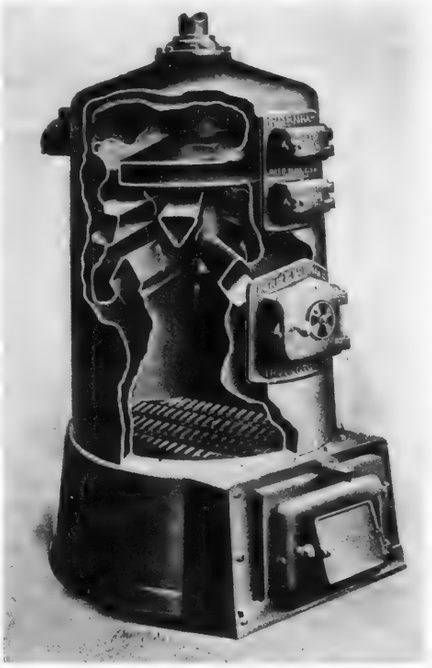
Three grandsons of the founders of the company, T. E. King, Harold King and F. W. Armitage, are still connected with the business and many of the employees have over forty years continuous service.

In 1856, F. A. Lord founded the Lord & Burnham Company which for many years manufactured boilers for greenhouse heating. Its first cast-iron boiler was manufactured in 1873. Gradually as production increased, these boilers became popular for house-heating and a separate department of Lord & Burnham was organized to take care of such additional business.

In 1920, a combination was effected with Hitchings & Company's boiler department, the consolidated company being named The Burnham Boiler Corporation. The foundries are operated at Irvington, N. Y., Elizabeth, N. J., and Lancaster, Pa. At Lancaster a new and modern plant recently completed produces both round and square sectional boilers for heating and hot water supply. Tubular radiators are manufactured at Zanesville, O.



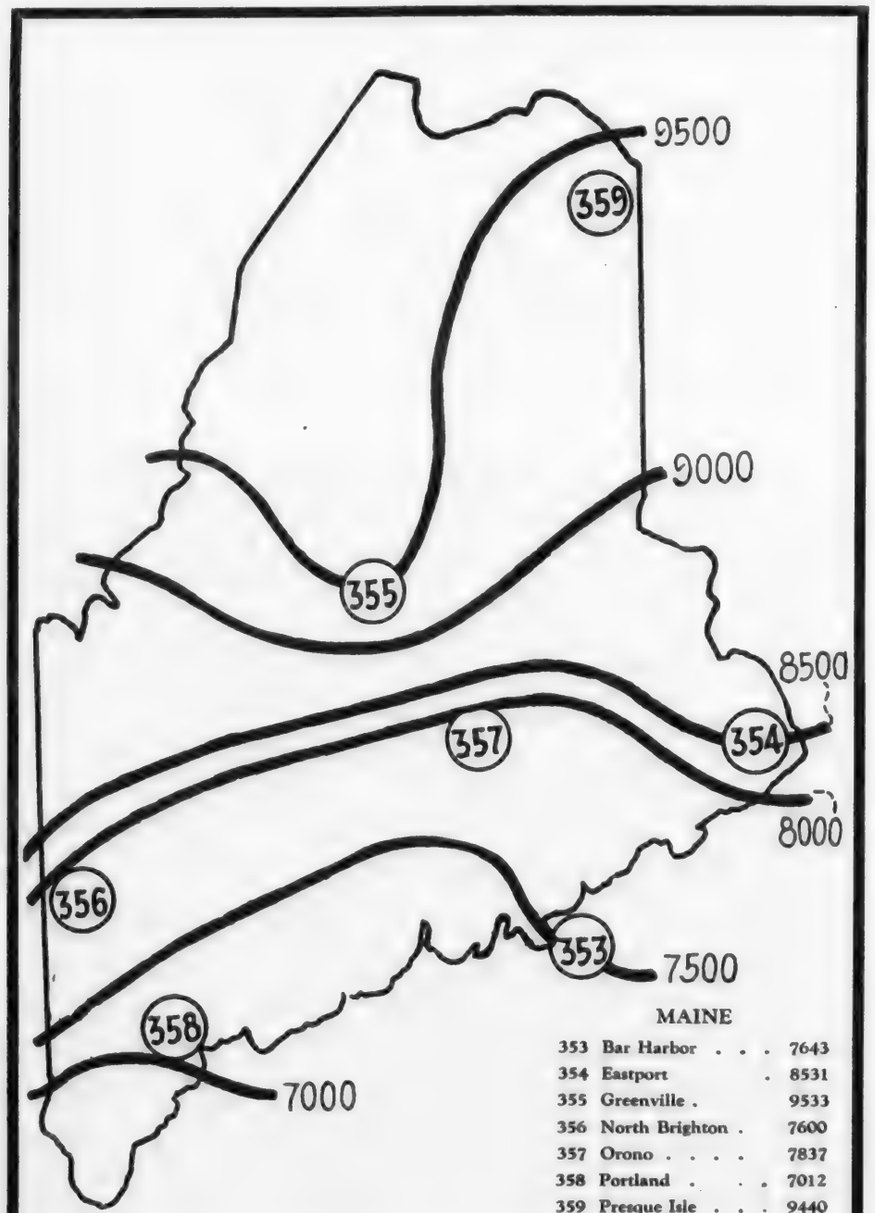
This Old Hitchings & Company Sectional Tubular Boiler Resembles Modern Steel Types



Round Burnham Water Boiler as Made 28 Years Ago

Heat Transmission is the subject of a special report (No. 11) issued by the Department of Scientific and Industrial Research, in England. It appears under the authorship of Margaret Fishenden, D.Sc., F. Inst.P., and A. F. Dufton, M.A., D.I.C. The report consists essentially of two portions, the first containing a short note by Mr. Dufton giving values of the thermal resistances of various types of walls and building materials, based on the work of Dr. Ezer Griffiths, F.R.S., at the National Physical Laboratory in London. There is also an alignment chart for the derivation of an approximate "air to air" coefficient under different conditions of exposure.

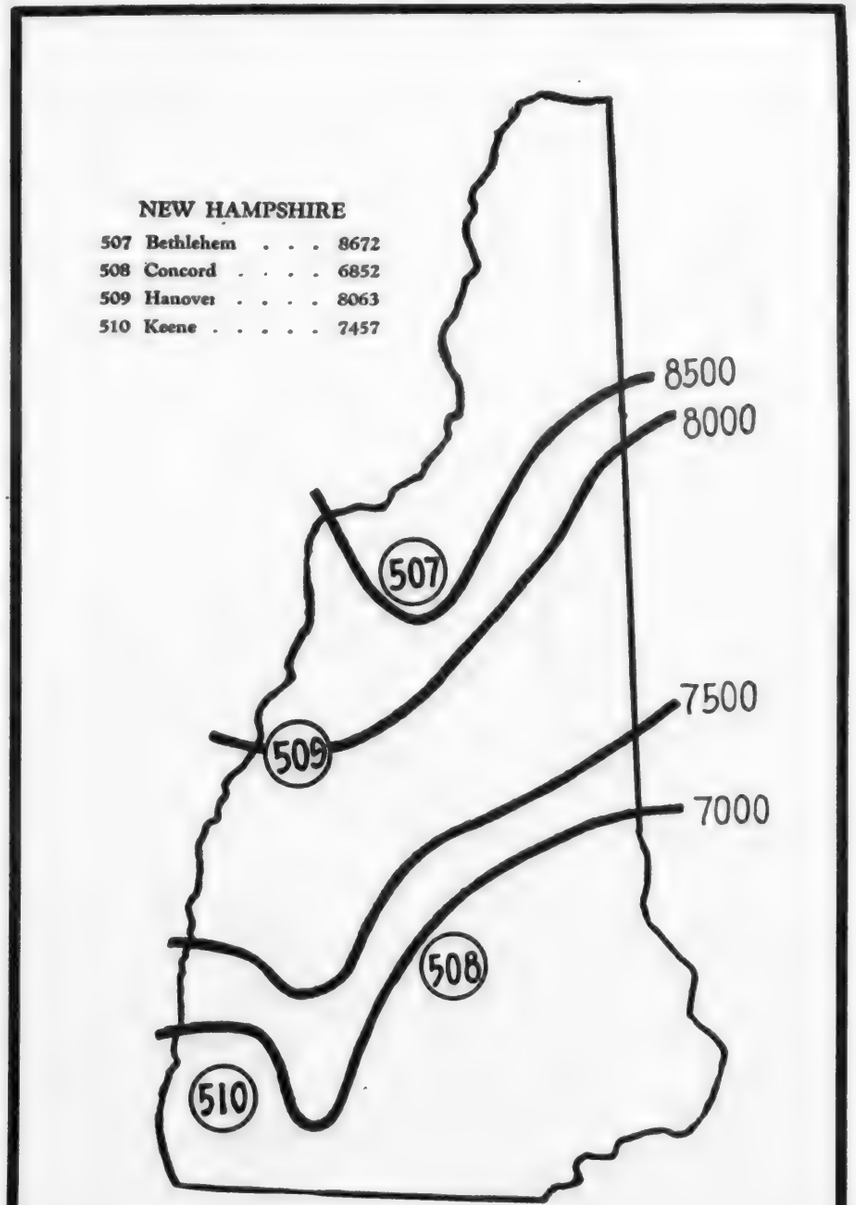
In the second portion of the report, Dr. Margaret Fishenden presents a resume of the phenomena affecting heat transmission through the fabric of buildings and the laws governing the transfer. Doctor Fishenden's account follows closely a paper read by her, in 1927, before the British Institution of Heating and Ventilating Engineers. The report is available at 20c from the British Library of Information, 5 East 45th St., New York.



MAINE

353	Bar Harbor	7643
354	Eastport	8531
355	Greenville	9533
356	North Brighton	7600
357	Orono	7837
358	Portland	7012
359	Presque Isle	9440

ISO-DEGREE-DAY CHARTS—Maine | No. 5 New Series



NEW HAMPSHIRE

507	Bethlehem	8672
508	Concord	6852
509	Hanover	8063
510	Keene	7457

ISO-DEGREE-DAY CHARTS—New Hampshire | No. 5-A New Series

Heating and Piping Contractors National Association

Heating Contractors Adopt Principles Governing Sales of Gas Appliances

FURTHER cooperation between the Heating and Piping Contractors National Association and the American Gas Association is assured through the adoption by the H. & P.C.N.A. of the "Merchandising Principles for Developing Greater Sales of Gas Appliances," formulated by the board of the A.G.A. These "Principles" were acceptable to the heating contractors' association with certain minor changes, which readily were agreed to by the A.G.A.

The "Principles" in their revised form are as follows:

Since gas appliance sales and gas sales are so closely related and so dependent on each other, and

Since the service rendered by the appliance to the gas customer is what the customer is ultimately paying for, and

Since the proper appliance for a specific service, the correct and safe installation of the appliance, the proper customer instruction in the correct use of the appliance and a speedy service for repair and maintenance of the appliance are necessary factors in every gas appliance sale to a gas utility customer.

First, manufacturers of gas appliances, dealers in gas appliances, the gas utility and the gas customer will more largely benefit by the gas utility extending its policy of merchandising gas appliances to encourage greater sales by trades.

Second, the margin on all gas appliances sold by the gas utility should be sufficient to cover all merchandising costs incurred, and thus enable progressive retail trades to merchandise gas appliances at a reasonable profit. It is recognized, however, that certain expenses incurred in the pioneering of appliances which have not yet met with sufficient local public acceptance to be generally accepted as merchandise items, should properly be charged to the promotion accounts of the utilities and not charged to merchandising.

Third, all local sales efforts by gas utilities and trades should be based on the merchandising of those appliances which conform to standards established by specialists of the United States Bureau of Mines, United States Public Health Service, United States Bureau of Standards and the American Gas Association as outlined in bulletins which may be obtained through the American Gas Association.

The Associations concerned recommend to individual gas companies and trades, the advisability and the necessity of greater sales activities in local fields for the ultimate purpose of increasing the sale of gas appliances and of promoting the proper use of gas, and

Further recommend that proper and adequate service to the ultimate gas consumer be recognized as essential to all progressive sales efforts.

Heating and Piping Contractors
National Association
By Walter Klie, President
American Gas Association
By Alexander Forward,
Managing Director

August 1, 1929.

Members of the American Gas Association are receiving the revised set of "Principles" accompanied by the following recommendations:

1. The gas company's advertising could be designed to promote trade sales as well as utility sales. If possible, an advertising campaign, financed jointly by the company and the trades, could be carried on.
2. Arrangements could be made to finance the trades on installment sales.
3. There could be a dealer contact man or organization to:
   a. Educate the trade so that it will recommend the appliance best suited for the customer's needs.
   b. Keep in touch with the trades' problems and harmonize the sales efforts.
4. The compensation schedule for utility salesmen could compensate for sales efforts which are productive of trade sales.
5. All sales efforts could be premised on the sale of tested and approved appliances as rapidly as approved appliances are available.
6. The gas company could make available a speedy service for repair and maintenance of all approved appliances sold by the trades as well as those sold by the gas company.
7. Gas companies could to advantage cooperate with those local heating and piping contractors associations which are operating a certified heating program.
8. All possible mechanical work peculiar to the trades cooperating could be left with those trades providing the gas business is not adversely affected.
9. Proper customer instruction in the correct use of the appliance could be extended to cover approved appliances sold by trades.

These "Merchandising Principles for Developing Greater Sales of Gas Appliances" and the suggested details of local cooperative activities are not to be construed as committing the company members in respect to existing local merchandising practices and policies.

Trade Cooperation Committee.

August 1, 1929.

Bulletin of H. & P. C. Pittsburgh Association Features Our Silver Anniversary Number

Through a series of monthly bulletins sent to architects, builders, owners, contractors and others, the Heating and Piping Contractors Pittsburgh Association is doing an effective job in the interest of certified heating. In Bulletin No. 14, issued under date of August 1, 1929, the association very graciously called the attention of the industry to the Silver Anniversary Number of THE HEATING AND VENTILATING MAGAZINE.

Under the heading of "The Heating and Ventilating Magazine, 25th Anniversary Number, June 1, 1929," the bulletin goes on to say:

"We feel that it is within the province of these letters to call the attention of our readers to any noteworthy article or publication pertaining to any phase of the Heating Industry. Such a production is surely the June number of the Heating and Ventilating Magazine, celebrating as it does its twenty-fifth birthday.

"In all of these letters we have been trying to emphasize the importance of the Industries of Heating and Ventilating to modern life and the absolute dependability on these two industries of all building of public or private character. Without the heating in all and the ventilating in many, such building would be simply useless.

"We have also called your attention to the comparative youthfulness of the Industry—not even one hundred years of service to building progress and yet it boasts of a degree of maturity that suggests a very much longer period of time.

"This anniversary number of the 'Heating and Ventilating' is most unusual in many ways. First, the history of this magazine, in a maximum degree, typifies the birth and growth of the Industry. Those of us who recall the demuré unpretentious little sheet of

twenty-five years ago, find difficulty in ascribing to it the parentage of the wonderfully rich, beautifully illustrated and authoritatively written number of June, 1929.

"Then again, the editor has gathered together a great number of men who are in an extreme degree, the pioneers and makers of our profession; whose articles are not only interesting and illuminating but are distinctly of great historic value. We need such articles and as many as we can get to help us to a full knowledge of the men who first ventured to try to keep the world comfortable in cold weather.

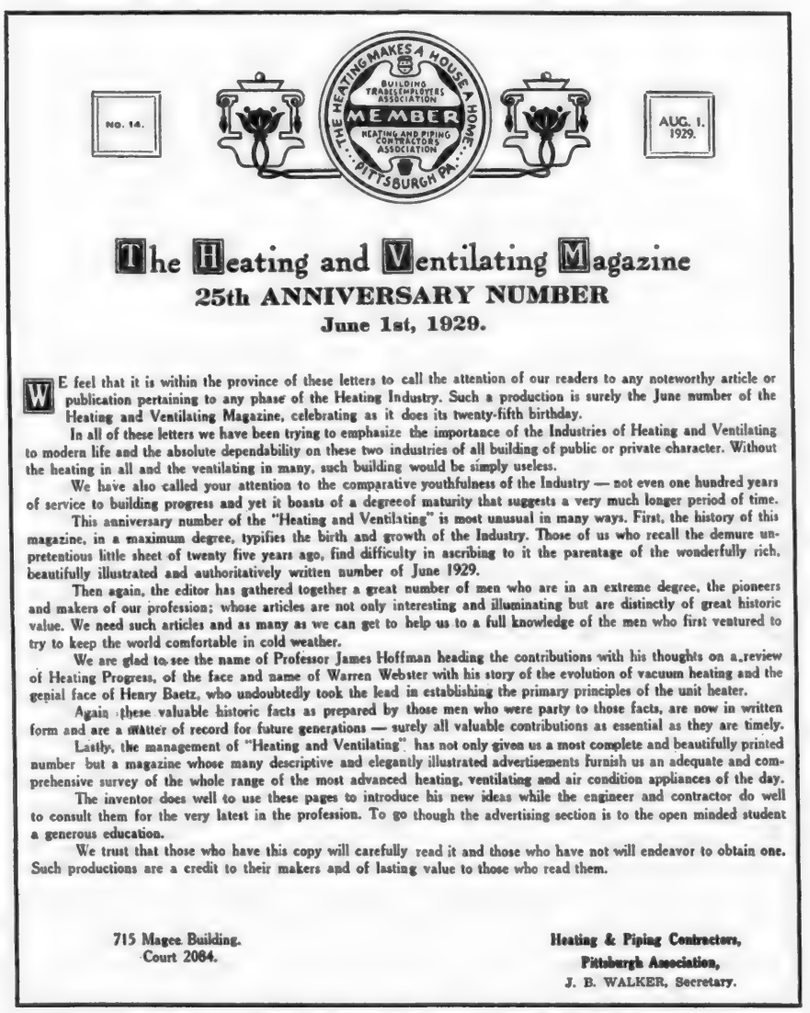
"We are glad to see the name of Professor James Hoffman heading the contributions with his thoughts on a review of Heating Progress, of the face and name of Warren Webster with his story of the evolution of vacuum heating and the genial face of Henry Baetz, who undoubtedly took the lead in establishing the primary principles of the unit heater.

"Again, these valuable historic facts as prepared by those men who were party to those facts, are now in written form and are a matter of record for future generations—surely all valuable contributions as essential as they are timely.

"Lastly, the management of 'Heating and Ventilating' has not only given us a most complete and beautifully printed number, but a magazine whose many descriptive and elegantly illustrated advertisements furnish us an adequate and comprehensive survey of the whole range of the most advanced heating, ventilating and air condition appliances of the day.

"The inventor does well to use these pages to introduce his new ideas while the engineer and contractor do well to consult them for the very latest in the profession. To go through the advertising section is to the open minded student a generous education.

"We trust that those who have this copy will carefully read it and those who have not will endeavor to obtain one. Such productions are a credit to their makers and of lasting value to those who read them."


No. 14.
THE HEATING MAKES A HOUSE A HOME
BUILDING TRADESEMPLOYERS ASSOCIATION
MEMBER
HEATING AND PIPING CONTRACTORS ASSOCIATION
PITTSBURGH PA.
AUG. 1. 1929.
The Heating and Ventilating Magazine
25th ANNIVERSARY NUMBER
June 1st, 1929.
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This anniversary number of the "Heating and Ventilating" is most unusual in many ways. First, the history of this magazine, in a maximum degree, typifies the birth and growth of the Industry. Those of us who recall the demure unpretentious little sheet of twenty five years ago, find difficulty in ascribing to it the parentage of the wonderfully rich, beautifully illustrated and authoritatively written number of June 1929.
Then again, the editor has gathered together a great number of men who are in an extreme degree, the pioneers and makers of our profession; whose articles are not only interesting and illuminating but are distinctly of great historic value. We need such articles and as many as we can get to help us to a full knowledge of the men who first ventured to try to keep the world comfortable in cold weather.
We are glad to see the name of Professor James Hoffman heading the contributions with his thoughts on a review of Heating Progress, of the face and name of Warren Webster with his story of the evolution of vacuum heating and the genial face of Henry Baetz, who undoubtedly took the lead in establishing the primary principles of the unit heater.
Again these valuable historic facts as prepared by those men who were party to those facts, are now in written form and are a matter of record for future generations — surely all valuable contributions as essential as they are timely.
Lastly, the management of "Heating and Ventilating" has not only given us a most complete and beautifully printed number but a magazine whose many descriptive and elegantly illustrated advertisements furnish us an adequate and comprehensive survey of the whole range of the most advanced heating, ventilating and air condition appliances of the day.
The inventor does well to use these pages to introduce his new ideas while the engineer and contractor do well to consult them for the very latest in the profession. To go though the advertising section is to the open minded student a generous education.
We trust that those who have this copy will carefully read it and those who have not will endeavor to obtain one. Such productions are a credit to their makers and of lasting value to those who read them.
715 Magee Building.
Court 2084.
Heating & Piping Contractors,
Pittsburgh Association,
J. B. WALKER, Secretary.

One of a Series of Monthly Bulletins Sent to Architects, Builders, Owners, Contractors and Others in the Interests of Certified Heating, by the Heating and Piping Contractors Pittsburgh Association

Tri-State Organization of Heating Contractors in Northwest

Plans for the organization of a Tri-State Heating and Piping Contractors Association for Minnesota and North and South Dakota were announced at the first annual convention of heating contractors from these states, held August 26, at Dunwoody Industrial Institute, Minneapolis. Steps are being taken to pledge the new association to the Certified Heat program.

Merwin Porter, of Minneapolis, acted as chairman. He stated that the meeting had been called to acquaint heating and piping contractors of the three states with the acknowledged merits of Certified Heat. Other speakers were Fred C. Stiller, president of the Heating and Piping Contractors Minneapolis Association; Charles A. Honold, who described the development of the Certified Heating program in Sheboygan; John S. Jung, a director of the national association; Edward G. Byrd, national field representative, and Victor Peavy, executive manager of the Minneapolis association.

During the course of the meeting, Dr. C. A. Prosser, director of the Dunwoody Industrial Institute, addressed the meeting. The institute, he said, stood ready to cooperate with heating and plumbing contractors in an intensive program of technical training for apprentices and helpers. After his address he escorted the delegates through the school, where they had an opportunity to inspect the shopwork being done by the pupils.

New Albany Association Elects Officers

Officers elected for the new H. & P. C. Albany Association, which was announced in last month's issue, are: President, E. W. Tompkins; manager, John H. Doerr, and secretary, Raymond Niles.

World Engineering Congress in Tokio

Sixty-six American engineers are included in the official list of delegates from the United States to the World Engineering Congress in Tokio. The delegates selected represent all branches of engineering and technology in this country. Both the American and foreign delegations will sail for Tokio October 10 from San Francisco, on two steamers which have been chartered for this trip.

Among the American engineers in the delegation is Willis H. Carrier, president of the Carrier Engineering Corp., Newark, N. J. He will be accompanied by Mrs. Carrier.

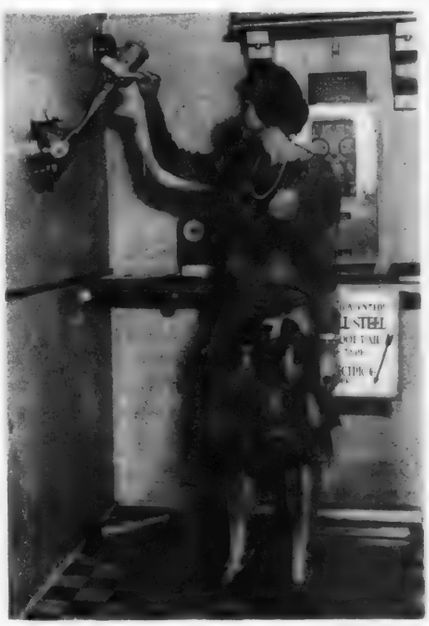
Oxy-Acetylene Welder's Handbook

An important addition to the literature on welding has recently been published in the form of "Oxy-Acetylene Welder's Handbook," by M. S. Hendricks, editor of *Acetylene Journal*.

The book covers the fundamentals of oxy-acetylene welding in a clear and helpful manner. Important operating factors involved in welding are discussed principally from the standpoint of welding on steel. However, the book is not lacking in complete information regarding the correct technique for welding other ordinary metals.

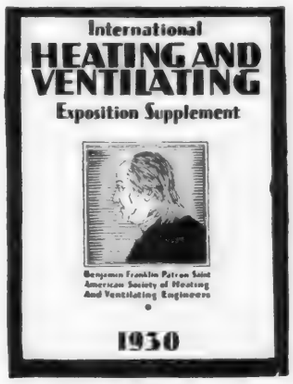
There also are a number of special fields for welding, such as pipe welding, tank welding, etc., for which much information of value is included in the handbook. A particularly interesting feature is the method of treatment of such subjects as the training of operators and the inspecting and testing of welds. The subject of the design of welds is discussed in detail and well illustrated.

The table of contents includes: The Welding Gases; Welding Equipment; Setting-Up Equipment; Methods of Welding; Preparation for Welding; Inspecting the Weld; Training the Operators; Welding Properties of Common Metals; Testing; Important Applications. Published by the Acetylene Journal Publishing Co., 608 So. Dearborn St., Chicago, Ill. Size 4¼ in. x 6½ in. Pp. 208. Price $3.



Operating the New Vault Ventilator During Demonstration in Salmon Tower Building, New York

Pulling the ventilator automatically opens air supply at the same time sounding alarm. This prevents suffocation for those accidentally imprisoned.



International Heating and Ventilating Exposition Supplement

HEATING AND VENTILATING announces a special exposition supplement which will be published in connection with the forthcoming International Heating and Ventilating Exposition, to be held in Philadelphia next January, under the auspices of the American Society of Heating and Ventilating Engineers. From present indications the show will have the most comprehensive display of heating, ventilating and air-conditioning equipment ever assembled in one place. Among other things, the exposition will provide a unique opportunity to correct many misapprehensions on the part of the public as to the value of mechanical ventilation, to say nothing of the extent of the heating and ventilating industry.

As one of the original sponsors of a separate heating and ventilating show, it is gratifying to know that the success of the show already is assured. In the International HEATING AND VENTILATING Exposition Supplement, will be presented full information regarding the show and the exhibits, together with numerous feature articles reflecting the latest developments and trends in the industry, which promise a further rapid advance in the near future.

The supplement will be an exposition in itself, accurately portraying the state of the art in all of its branches, presented in a way that will make the publication of value and mutual interest to the public and to the industry.

Copies of the supplement will be placed in the hands of those attending the exposition and will be distributed throughout the industry, thus clinching the message embodied in the exhibits themselves.

David H. Roberts

David H. Roberts, of Cleveland, O., died September 5, after several years of ill health. He was born in Cleveland in 1864. Mr. Roberts was president of the National Association of Master Plumbers during 1916 and 1917, and had been active in association work for more than 40 years.

Death of Professor Goodenough

Prof. George Alfred Goodenough, widely known scientist of the University of Illinois and chairman of the Big Ten faculty committee on athletics, died of heart disease at his home in Urbana, Ill., September 29. Professor Goodenough, a native of Davison, Mich., was 61 years of age. He had been professor of thermodynamics at the university since 1911.

In 1891, he received his B. S. degree from Michigan Agricultural College, and did post-graduate work at the University of Michigan and the University of Illinois. The degree of Master of Engineering was conferred on him at the latter institution in 1900.

Before joining the faculty of the University of Illinois as instructor in mechanical engineering, Professor Goodenough taught at the Michigan Agricultural College. From 1893 to 1895, he was a text book writer on the staff of the International Correspondence School. He also was the author of several standard text books, among which is "Principles of Thermodynamics," and he is particularly well known to students of engineering as the author of "Properties of Steam and Ammonia."

Professor Goodenough was a member of the Society for the Promotion of Engineering Education and of the American Society of Mechanical Engineers. He also was a member of the Phi Gamma Delta fraterity, and of the honorary fraternities, Sigma Xi, Tau Beta Pi and Sigma Tau.

D. B. Skinner

D. B. Skinner, vice-president of the St. Louis Blow Pipe & Heater Co., Inc., St. Louis, Mo., died at the age of 59, September 12. He was born in Springfield, Mo., in 1869, and in 1890, came to St. Louis to enter into business with his father, George J. B. Skinner, under the firm name of Skinner & Sons, which company later was taken over under the name of Skinner Brothers as a partnership. The company was incorporated in 1912, with D. B. Skinner as president. In 1919, D. B. Skinner and his brother, C. N. Skinner, left Skinner Bros. Mfg. Company, and incorporated the St. Louis Blow Pipe & Heater Company.

The majority of all pipe work used in blow-pipe systems, in 1890, was manufactured from wood and a dust collector or cyclone was a comparative rarity. At that time there were no other blow-pipe companies in the entire territory between St. Louis and the Gulf.

Present Practice in Water Heating

IV—Cash System

THE expansion tank has been eliminated in favor of some form of closed-pressure system in some of the present-day water heating systems. Increased pressure speeds up the circulation, and different methods of obtaining this increased pressure are used by the different manufacturers. In the old Cash system, two valves are used, an automatic pressure-reducing valve and a pressure-relief valve. This type of closed-pressure system does not interfere with the use of a damper regulator, whether it be of the temperature or pressure-controlled type.

An installation of these two valves is shown in Fig. 1. The two valves are connected in the water supply line with the relief valve near the boiler and the city supply valve open. In operation, the city water pressure is reduced by the regulating valve to the pressure most suited for the particular installation to which it is connected, usually about 15 lbs. for a two-story house. If excessive firing causes the pressure to rise above a predetermined safety point—usually about 30 lbs.—the pressure-relief valve operates and expels enough water to bring the pressure down to the safe point.

As the water cools and contracts, with a resultant drop in pressure, the regulator automatically admits enough water to build up the desired pressure in the system. With each operation of the relief valve there is a small loss of water from the system, but it is seldom that this loss amounts to more than 10 gal. per month. In the case of automatic firing, such as is possible with oil and gas burners, the pressure may remain so constant that the relief valve will never be called into use.

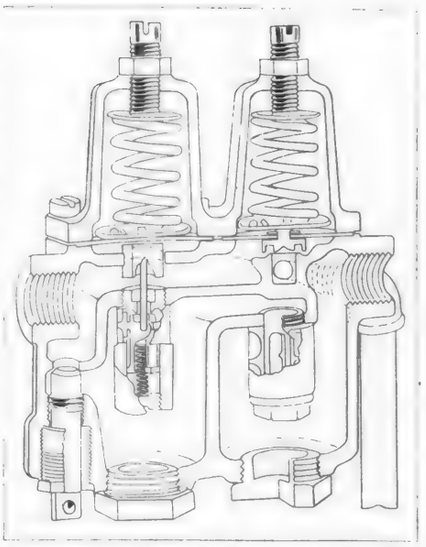


Fig. 3. Section of Acme Valve

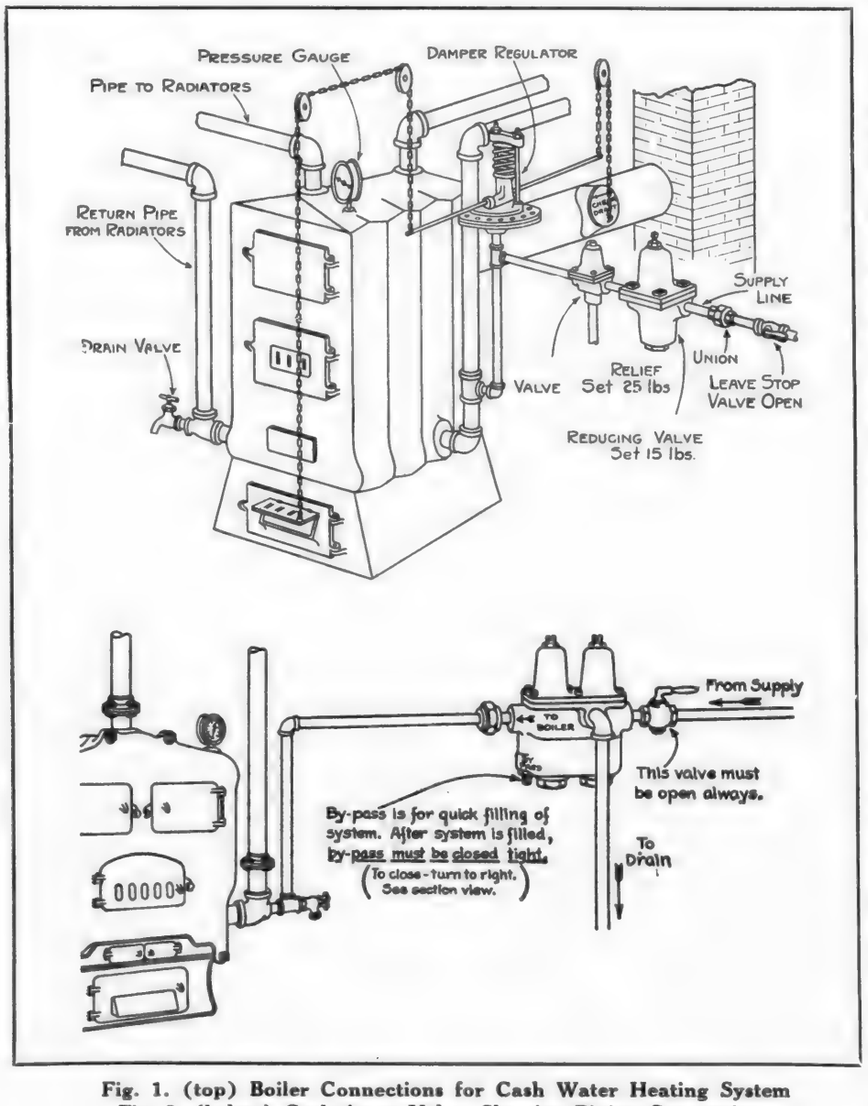


Fig. 1. (top) Boiler Connections for Cash Water Heating System
Fig. 2. (below) Cash Acme Valve, Showing Piping Connections

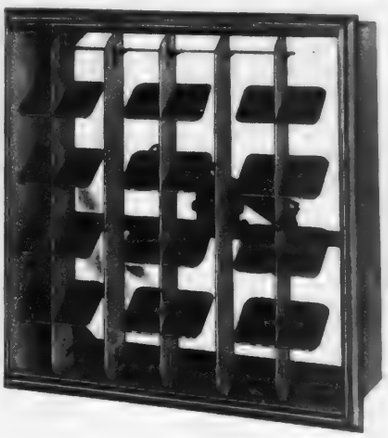
The essential features contained in the two valves just mentioned are the strainer, regulating valve and relief valve. In the Cash Acme valve, manufactured by the A. W. Cash Valve Mfg. Corp., Decatur, Ill., shown in Figs. 2 and 3, these three features are embodied in one casting, with an additional feature known as a by-pass. The by-pass, while intended for quick filling of the system, also shunts the initial slug of gritty, dirty water around the valves instead of forcing it through the regulator. When the system is filled the by-pass is closed and the regulating valve automatically maintains the desired pressure. Another advantage of the by-pass is that it makes possible cold water tests for leaks at city pressure without a change in regulator adjustment.

Any of these controls is adaptable to either new or existing water installations, including Arcola systems. The only change necessary is in three or four story installations where a higher pressure is required to force the water to the upper floors. A simple adjustment of the regulator will change the pressure regulation to carry such systems.

New Apparatus and Appliances

Supreme Oscillating Air Diffuser

Especially designed for theatre installations, the Supreme oscillating air diffuser concentrates the air in one jet that carries the air two or three times farther than is possible with the diffuser having diverging blades. The blades of the Supreme diffuser are always in the same relative position, at the same angle, but turn through an arc of 180° five times per minute. The full force of the blower, therefore, is concentrated on a score of seats momentarily, then off, then back again. The diffuser operates quietly and is run by air from the blower itself, so that no power is required. This diffuser is manufactured by the Supreme Heater & Ventilating Corp., St. Louis, Mo.



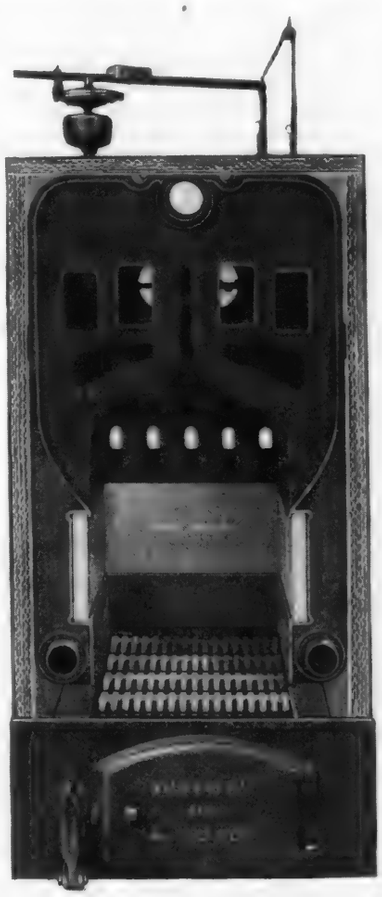
Supreme Oscillating Air Diffuser

Smith "16" Jacketed Boiler

Of unusual design, the number "16" Smith jacketed boiler has been announced by the H. B. Smith Co., Westfield, Mass. The three outstanding features of the boiler are the large combustion space, the provisions for burning the coal with high efficiency, and the large amount of heating surface. Special air intake holes are placed in the back section close to the surface of the burning fuel to allow an ample supply of air essential for high volatile bituminous coal. An air supply damper is provided at the intake so that the air supply can be shut off or throttled when anthracite coal is burned.

A firebrick lining is incorporated in the fire box to aid in eliminating the cooling effect of the side walls, and to maintain an even combustion rate over the fire bed.

The boiler is jacketed and finished in scarlet black. The width of the grate is 16 in. It is available in both steam and water types, in capacities ranging from 350 sq. ft. to 1250 sq. ft. of steam radiation.



Smith 16-In. Jacketed Boiler

Device for Testing and Recording Properties of Oils

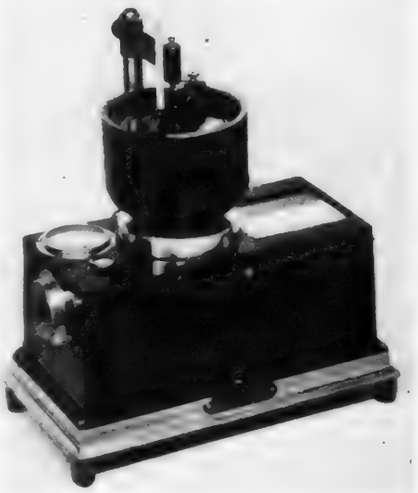
A precision instrument designed mechanically to test and record on a chart the lubrication value of oil and other liquids at varying temperatures has been announced by the Consistometer Corp., Chicago.

Known as the Consistometer, the device uses approximately 8 oz. of the oil to be tested. In the hot tenacity test, the bearing surfaces revolve submerged in the oil. Outside the test bowl is another bowl, containing a heating element and a quantity of bath oil for a hot test, and CO_2 snow for a cold test.

The outer bowl is built with double walls and acts practically as a thermos bottle. This arrangement prevents the transmission of heat from the test bowl into the working mechanism of the apparatus. Jewel ball bearings are provided and the unit is mounted on a fine, hardened, cone-shaped steel point. Hot tenacity tests, it is stated, may be run with the Consistometer on any oil drawing mechanically a viscosity curve from 100° F., or from any other temperature desired, up past the point of transition to the points of film-thin and film-rupture, until the oil has lost its practical lubrication value. It is also possible with the Consistometer to draw a cold fluidity test curve from 100° down to the point where the oil loses its true fluidity and lower, until it becomes a stringy mass and channels. Each of the tests described may be made in from 15 to 20 min.

In drawing hot viscosity curves, the instrument indicates the point of transition of the oil, while in cold fluidity tests it registers, by inscribing a V in the curve on the chart, the first time the oil wholly fails. Some indication of the precision methods used in the construction of the instrument is given in the statement that the disc compression springs are compressed more than 25,000 times coil to coil, in oil at 750° F., and thereafter are ounce-weight calibrated to 14 lbs. pressure. Shackle springs of specialllly-tempered chrome vanadium wire, elongated at least a thousand times, thereafter are gram-weight calibrated before being accepted.

Paul W. Peterson, for some time vice-president and general manager of the Absolute Con-tac-tor Corporation, recently purchased the stock of the Consistometer Laboratory and Manufacturing Company, and has since completed the organization of the Consistometer Corporation.



Consistometer for Testing Properties of Oil

Stat-Amatic Temperature Regulator

Stat-Amatic Temperature Regulator

An electrical temperature regulator, especially designed for gas-house-heating, has been announced by the Stat-Amatic Instrument and Appliance Co., Hartford, Conn. The equipment consists of a thermostat to be located in a suitable place on the first or second floor, an electric motor and self-winding clock unit, to be mounted in the basement near the furnace or boiler and connected electrically with the room thermostat, and mechanically with the boiler's gas supply valve or similar point of control on the furnace.

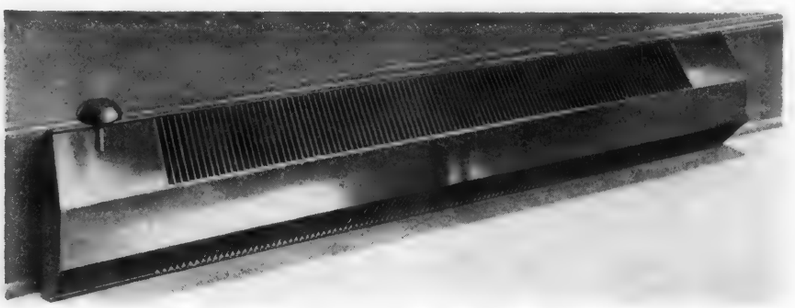
The room thermostat controls the room temperature by two independent settings, one for day temperature, the other for the desired night temperature. The motor, in connection with a 15-jewel self-winding clock, operates the control valve.

Richmond Floorline Radiator

A light-weight heating element, the Richmond Floorline radiator, made of steel or copper fins welded on pipe, has been announced by the Richmond Radiator Co., 1480 Broadway, New York. It is made in units 8½ in. high, 3½ in. wide, and either 36 in. or 18 in. long. The units may be installed separately or joined end to end or placed one above the other to give the required capacity.

The radiator may be used in installations in either old or new buildings, or to replace older types of radiation. If ankle height, it gives off heat near the floor where it is most needed. When painted to match the trim of the woodwork it is inconspicuous. It also can be half recessed or completely recessed within the wall.

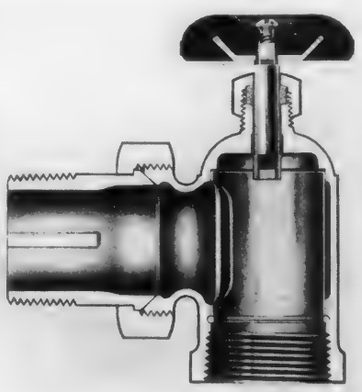
Certifications of efficiencies and ratings by the Frost Research Laboratory, Norristown, Pa., and Prof. S. E. Dibble, of the Carnegie Institute of Technology, have been made according to the code of the American Society of Heating and Ventilating Engineers, and show a 36-in. section to be equivalent to 15 sq. ft. of cast-iron radiation.



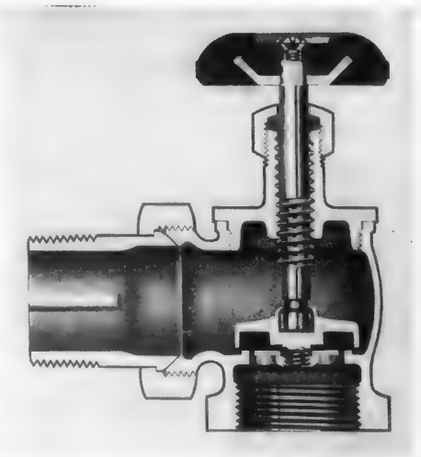
Richmond Light-Weight Floorline Radiator

Crane Low Type Radiator Valves

A line of Low Type brass radiator valves has been announced by Crane Co., Chicago, Ill. Numbers 112 and 113 are designed to supply the demand for high grade valves of the packed type. They are adaptable to steam installations in homes, hotels and large buildings. In these types the Crane renewable radiator valve disc is held against the forged brass swivel disc holder by means of a brass washer and nut. Such a combination permits easy access to the operating parts of the valve.



No. 174 Low Type Radiator Valve for Water Installations



No. 112 Low Type Radiator Valve for Steam Installations

The Number 174 Low Type valve is compact and suitable for hot water installations, except forced feed, where the amount of head room is small. The disc is constructed of brass tubing and is arranged to open or close in a quarter of a turn. An outside indicator shows the exact position of the opening in the disc. The disc is designed with a 1/16 in. hole in order to secure circulation when the valve is in the closed position. The Numbers 112 and 113 valves are available in six sizes from ½ in. to 2 in. Number 174 can be supplied in five sizes from ½ in. to 1½ in.

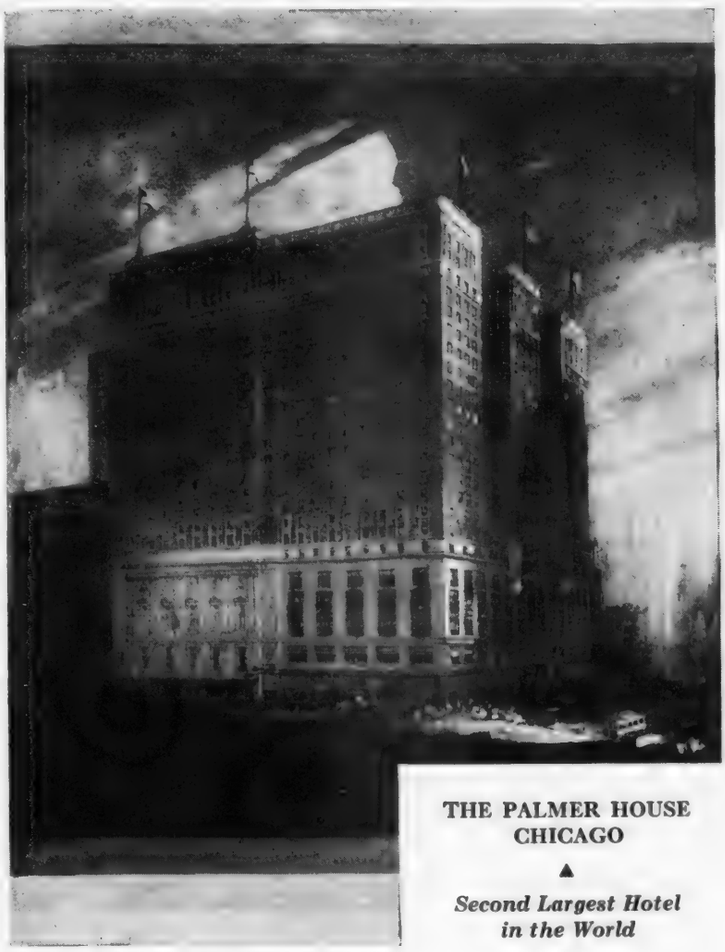
Mechanical Fireman Automatic Coal Burner

A screw feed stoker known as the Mechanical Fireman automatic coal burner is being marketed by the Mechanical Fireman Corp., Canton, O. The device is controlled automatically through a boiler limit control, a thermostat and an automatic switch. A shear key protects the stoker in case any foreign substance is introduced into the hopper, and a special door opens at the shear key so that the new part can be installed without difficulty.

A dust tight gear case, gears of alloy steel and bronze, a heavy cast steel screw, and five coal feeds with one neutral position, are features of the burner. Journaled parts run in Timken bearings, immersed in oil, and a ball bearing motor is direct connected to the drive and fan. The screw is backed by a ball thrust bearing.

Available in six sizes, capacities range from 4,000 to 32,000 sq. ft. of steam radiation. Hopper capacities range from 12 to 23 cu. ft.

Higher First Cost ▲ ▲ ▲ ▲ ▲



THE PALMER HOUSE
CHICAGO

▲

Second Largest Hotel in the World

▲

Architects
HOLABIRD & ROOT
Heating Contractor
PHILLIPS-GETSCHOW CO.
Plumbing Contractor
J. J. DALY

▲ ▲ ▲

The Powers Vapor Disc Thermostat
It costs more. It's worth more! Because it often gives 15 to 20 years of accurate control without repairs of any kind.

of Powers Control is justified in the end ▲ ▲ ▲ ▲ ▲

SYSTEMS of Automatic Temperature Control that need yearly adjustments and frequent repairs are not only annoying, but waste Fuel and cause much discomfort.

These troubles and the annual "SERVICE" bills, which so often come with lower *first-cost* systems of temperature control, will not be known by the owners of the Palmer House. For in selecting Powers control for the Heating and Ventilating and Hot Water Service equipment of this prominent hotel, the Architects provided their clients with a system of control that gives many years of Accurate, DEPENDABLE service without repairs or adjustment.

THE POWERS REGULATOR CO.
35 Years of Specialization in Temperature Control
Chicago: 2718 Greenview Avenue
New York: 137 East 46th Street
Offices in 35 Other Cities
The Canadian Powers Regulator Co., Ltd., Toronto, Ont.

POWERS

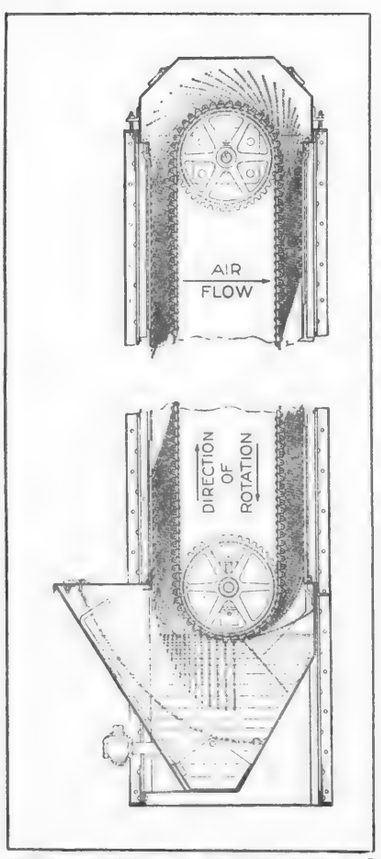
Reed Multi-Panel Air Filter

A self-cleaning Multi-Panel air filter has been announced by the Reed Air Filter Co., Louisville, Ky. This unit, developed especially for heavy duty uninterrupted service, is of an overlapping panel construction, and combines the air-cleaning and self-cleaning features as an integral part of the continuous cycle of operation.

Each panel is sprayed with liquid bakelite, coated with fine fibre and oven baked. This forms a porous fibrous coating capable of retaining many times the amount of oil and dirt that normally would be held on the smooth bare wire.

When the Multi-Panel filter curtain is in the air stream the closely overlapping woven-wire panels form a thick screen having a high efficiency in dust removal. As the curtain enters the reservoir at the base of the filter, the panels automatically separate and are individually cleaned by swinging through the oil in an arc of 90°. While in the oil bath the panels remain suspended vertically, permitting the dust and dirt to settle freely to the bottom of the reservoir.

The filter curtain is composed of overlapping screen panels, suspended from horizontal cross rods spaced at intervals of 1.8 in. Each panel is provided with an ⅛ in. stiffening rod at its bottom or free edge.



Sectional View of Reed Multi-Panel Air Filter

New Trade Publications

The Bryan Copper Tube Boiler is described in a folder issued by the Bryan Steam Corp., Peru, Ind. The folder includes a detailed description and illustrations of the boiler dome, boiler end, base ring, tube section and domestic water coil, together with drawings showing the effects, so far as heat transmission is concerned, of using a coal-burning boiler compared with the Bryan boiler when burning oil or gas. The six reasons for Bryan popularity are stated to be the rapid circulation, the efficient combustion, the high capacity, automatic control, economy and appearance.

Universal Gas, Garbage and Rubbish Incinerator is brought to the attention of the trade in a circular from the Cribben & Sexton Co., 700 North Sacramento Blvd., Chicago, Ill. Features of the incinerator include a tapered inner shell, causing the garbage to sag to the center section directly about the dryer; the dryer itself, which acts to retard the passage of heat to the flue pipe; the ribbed fire pot, and the combined burner and grate.

Rigged for Results is the slogan appearing on the cover of the latest catalog received from the Preferred Utilities Mfg. Corp., 33 W. 60th St., New York. This company was founded by oil-heating engineers who recognized the demand for accessories designed especially for oil-burning work, and among the products illustrated in the catalog are numerous devices manufactured by the company as well as many accessories for which the company acts as jobber in the metropolitan, New England and eastern New York territory. Illustrated and described in this catalog are many types of dampers, valves, strainers and tanks, as well as the Time-O-Stat controls, Taco heaters, Combination boilers, Telegage, Teesdale pumps, Draft-A-Justor, Janette Hydrolator, Fulton Sylphon regulators, Hays gauges and Orsats, Purolators, etc. In the data section the new oil specifications are included, together with many tables, formulas and symbols of interest to heating engineers and dealers in general and oil-heating men in particular. Size 9 in. x 12 in. Pp. 64.

Simplex Gas Boilers are illustrated and described in a booklet published by the Simplex Boiler Co., Pittsburgh, Pa. These boilers are equipped with electric controls and are fully jacketed. Steam and water outlets are on the top and the boiler has a 26 in. water line. The gas burner is of crossbar type and all the parts are in one unit. All ports or outlets are elevated on small bosses and there are slots between every two lines of ports. Air mixer and venturi tube conform to recommendations of the U. S. Bureau of Standards.

There is one gas burner between every two sections, and on all sides of each burner are the water-legged walls of the firebox. The front panel of the jacket is removable, affording convenient access to the boiler. The jacket is made of Transite, ¼ in. thick, lined with 1 in. of Asbestocel.

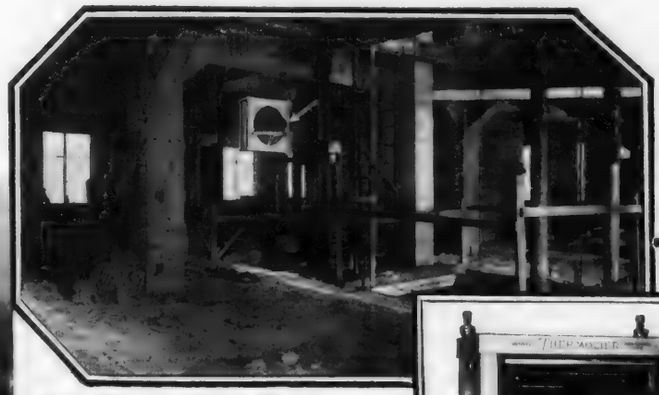
These boilers are available in 25 sizes in either water and steam types, with capacities ranging from 154 to 3850 sq. ft. of steam radiation and from 256 to 6391 sq. ft. of water radiation A. G. A. ratings.

Automatic Controls for Oil, Gas, and Coal Burners is the title of a catalog issued by Time-O-Stat Controls Co., Elkhart, Ind. Electrical lockswitches and thermostat switches are featured. The catalog is the first issued by the company since its recent expansion and furnishes impressive evidence of the extent of the company's line. Now entering its fourth heating season, the company's Lockswitch system for oil-burner control and the company's thermoswitch for the direct operation of any burner equipped with the Lockswitch system are given first place in the catalog. One of the interesting types of thermoswitches shown is a table instrument which obviates the necessity of cutting through the decorated walls. Among other products covered in the catalog are the Time-O-Stat electric control motor, hydroswitch and Hywatt electric line control.

Combination Triple Service Boilers are described in catalog A-29 received from the Combination Boiler Co., Benton Harbor, Mich. Illustrations of the Triple Service boiler when burning oil or gas and when burning bituminous coal are shown. The catalog contains detailed dimension and capacity tables. Considerable data on hot water supply requirements are given, and a leaflet contains the reports of four tests made by G. F. Gebhart on the type S-1250 combination steel water tube boiler when burning oil. During the tests the efficiency of the boiler and oil burner ranged from 71.5% to 81.9%.

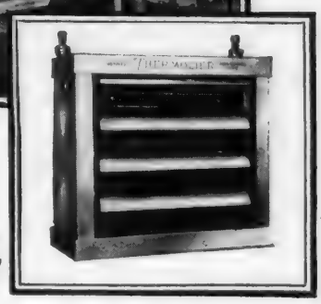
Trane Under-Window Concealed Heaters are described in Bulletin 25 of the Trane Co., La Crosse, Wis. The Trane heater is a complete unit designed primarily for installation under windows. Capacities range from 5.5 sq. ft. on the smallest under-window outfit to 117 sq. ft. on the largest.

50 *years heating experience in 5 cubic feet*



Foshay Tower—Minneapolis
Magney & Tuslers, Inc., Archts. & Engrs.
Conners Plumbing & Heating Co., Inc., Contractors
W. B. Foshay Company, Owners

Made in eight models to fit any space and every condition



Heat while you build

EXECUTIVES of the W. B. Foshay Co., investment house, don't guess. Modern financing demands facts and figures for decisions. And decisions are made on what should be possible plus what *is possible.*

"I know you will be glad to learn," writes Mr. C. C. Darnell, Vice President, "that Thermoliers in the new Foshay Tower worked fine, and I am informed the cost of operation was considerably less than the cost of operating regular radiators. Our contractors gave us a very favorable report in this matter."

One Thermolier, a Grinnell development in unit heaters, was installed on each floor for temporary heat. Steam was delivered at 35 pounds pressure. Floor area 80 by 80 ft. Thermoliers in perfect condition after the job for permanent installation in the Foshay public garage.

Thermoliers reduce fire risks by replacing dangerous, open salamanders. Lowest possible labor costs for installing and dismantling.

Study the picture of actual Thermolier installation. Note how easily this Grinnell copper unit heater is installed. Adjustable swivel sockets take up vibration and allow heaters to be hung with a large variety of Grinnell Adjustable Pipe Hangers.

One ¾ in. thermostatic valve drains the unit perfectly without the usual outside cooling leg piping required with other unit heaters. Thermolier's special cooling leg is right in the unit. The return trap is square up against the heater itself.

This patented feature however, is only one of the 14 advantages making Grinnell Thermolier a better unit heater. Booklet detailing these additional points of superiority gladly sent on your request.

50 years heating experience in 5 cubic feet.

GRINNELL COMPANY

Executive Office: Providence, R. I.

Branches in all Principal Cities

14 Points of Superiority

GRINNELL COMPANY, INC.
208 W. Exchange St., Providence, R. I.

I want to read more facts about the Thermolier. Send along the booklet.

Name_____

Title_____

Firm Name_____

Address_____

Ultimate in Economy is the name of a sales leaflet published by the General Stoker Corp., 270 Lafayette St., New York, and describing the General Stoker for industrial plants and larger heating systems using boilers rated between 75 and 250 H.P. Designed to fill a need for a self-contained, automatically-controlled stoking unit, the machine feeds coal on the underfeed principle. A control dial enables the operator to select any one of eight speeds or neutral, to feed from 100 lbs. per hour to maximum rate.

Elimination of holes in the fuel bed is provided for through positive control of air for combustion. Use of the entire grate surface permits the proper volume of air to be introduced to the fuel bed at low velocity. Dialed damper controls enable the operator to send full fan delivery to any portion of the fuel bed. Automatic control is designed to maintain the steam pressure within a range of 2 lbs. The stoker comes in two sizes: Type E, for capacities from 75 to 125 H.P.; and Type F, for capacities from 150 to 250 H.P. Size 8½ in. x 11 in. Pp. 6.

Air Work, Bulletin A-50, issued by the Allen Air Appliance Co., Inc., Grand Central Terminal, New York, contains interesting sales descriptions and applications of the company's "triple A" centrifugal compressor. Applications of these compressors include ice manufacturing uses, agitation of liquids, combustion, gas blowers and pressure blowers, and other industrial applications. Included in the bulletin is a description of the company's vacuum-cleaning equipment. Size 8½ in. x 11 in. Pp. 12.

National Heat Regulation, covering the various types of controls manufactured by the National Regulator Co., Chicago, are featured in a group of fifteen bulletins issued by the company. Bulletin No. 5 describes the operation of a two-pipe graduated thermostat used on straight blast systems of heating for controlling mixing dampers. It also is used for the control of mixing dampers in unit heaters. Bulletin No. 5-4 describes a graduated two-pipe reversed thermostat for use with direct radiation. No. 5-6 describes a compound straight-graduated and positive thermostat for controlling two sources of heat supply. No. 5-8 discusses a duplex thermostat, graduated or intermediate type, for closing off heat sources from remote control. In Bulletin No. 5-10 is discussed a two-temperature control thermostat known as the National Triplex for use in maintaining normal temperature in an office or similar building during the hours of occupancy and a lower temperature the remainder of the time. Other bulletins describe a triplex graduated compound thermostat, with positive relay; a positive-acting thermostat, a one-pipe thermostat, an extension duct thermostat, the operation of accumulator control for heating coils, and pilot thermostats for the control of combined heating and ventilating systems. Other bulletins are devoted to Metaphram valves, motors, and dampers. Size 8½ in. by 11 in., with special binder. The bulletins are well illustrated with sketches and photographs.

Wesix Heat, The Heat of Electricity, is the title of a loose-leaf bulletin, issued by Wesix, Inc., 390 First St., San Francisco. A group of five examples shows exactly what it costs to heat representative homes by electricity.

Each example includes a photograph of the house in which an actual system is operating, a detailed description of the equipment, and cost of wiring and installation.

Figures also record the kilowatt consumption of the house by months for a period of one year and are accompanied by the electric power bill showing the consumption month-by-month. This information is taken from a group of houses ranging in size from five to eight rooms.

Other information includes architectural dimensions for the Wesix flush-type electric heater which can be installed in capacities from 1500 to 8000 watts. Detailed descriptions of the wall heater and the portable type convection heater are given.

Calculation of losses through different types of materials is made easy in a table which includes figures on watt-loss per hour per square foot for different types of building materials. Wiring specifications are stressed. A number of illustrations show Wesix heating systems in use.

In addition there is information on hot plates, and electric water heaters. Size 8½ in. x 11 in. A.I.A. file No. 31 G 31.

Mercoid Controls for Heating Equipment is the title of a new catalog (No. H 5) issued by the Mercoid Corp., 564 West Adams St., Chicago. Included in the products presented are Mercoid thermostats, pressure controls, immersion-type controls, Risertherms, pyratherms, ignition controls, and the Mercoid Interlock for the automatic control of oil burners. Six wiring diagrams show typical Mercoid wiring connections for oil-burner installations. Size 8½ in. x 11 in. Pp. 32.

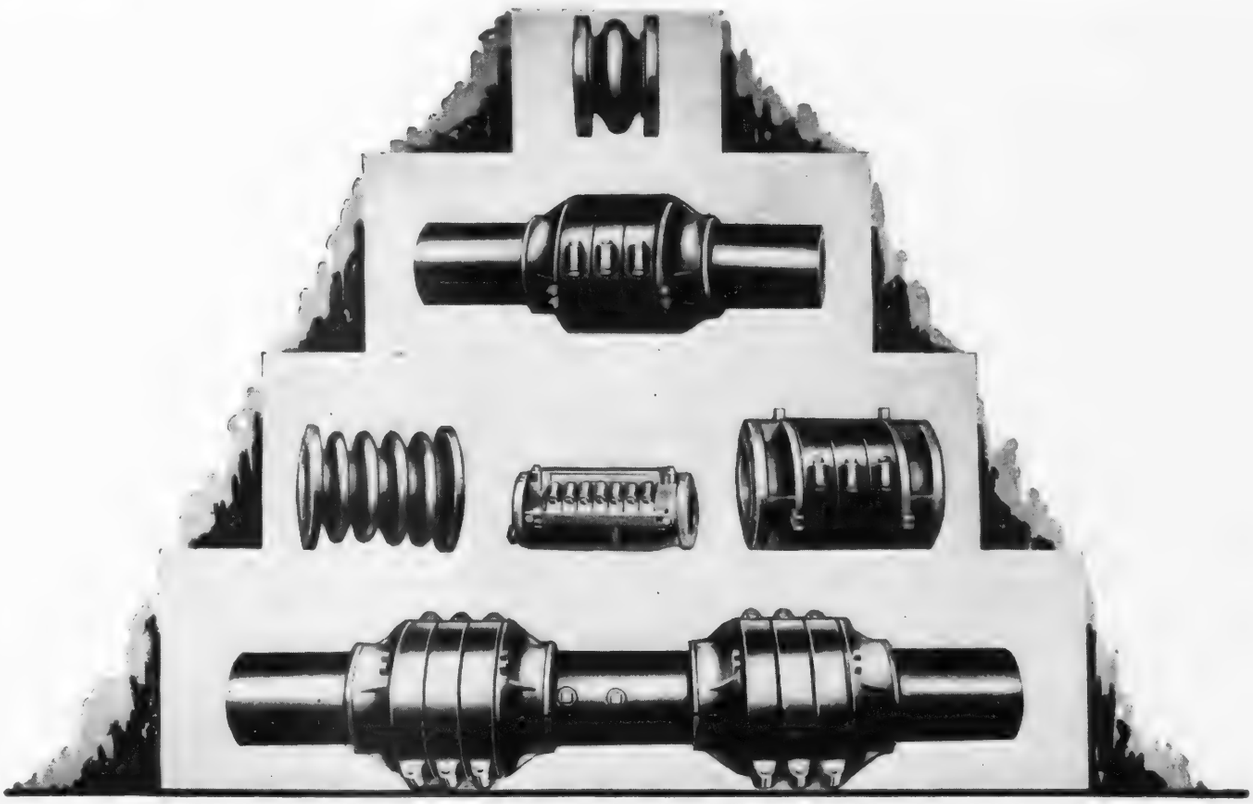
Penn Automatic Switches and other controlling devices are described in a catalog received from the Penn Electric Switch Co., Des Moines, Ia. Contacts in these switches are of the double-break brush type, the movable contact members being made of spring phosphor-bronze. Single and double-pull pressure switches, all-metal relief valve, three-way valve and float switches are described and illustrated. Two types of vacuum switches can be supplied, one with a maximum voltage of 250, the other 550 volts. The range of operation of both of these switches is from 1 in. to 28 in. of vacuum.

Automatic switches for temperature, pressure or vacuum service are available in several types. The type L Penn Magnet switch is used for the sensitive control of pressures and temperatures, where close differential between starting and stopping points is required. The company makes limit controls for heating systems, available for both heating or vapor pressures and also makes a room thermostat and safety control for oil burners. Size 8¾ x 11½. Pp. 48.

Electrically - Operated Temperature Regulating Systems are featured in a catalog published by Gold Car Heating and Lighting Co., Bush Terminal, Brooklyn, N. Y. Complete descriptions are included of the Gold type of thermostats, magnetic radiator valves, valve motor, thermostat regulating valve, signal bells, and complete systems. Full-page sketches show layout plans for adapting Gold automatic controls to various typical heating problems.

Recent Economic Changes in the United States is the title of a stimulating 32-page booklet issued by the United States Department of Commerce. Although it is a summary outline for the two-volume report published by McGraw-Hill Book Co., New York, there is much of business and engineering interest regarding standards of living, consumption, stability, leisure, power applications, unemployment, and credit. We believe that every man in the heating and ventilating industry should read this booklet. In one hour it gives the reader an authoritative, competent, and accurately-observed consensus of opinion regarding American economy for the years 1922-1929. Size 5¾ in. by 9¼ in. Price 5 cents, Government Printing Office, Washington, D. C.

A Manual for Architects on Anthracite in modern architecture has been published by the Anthracite Coal Service, 1421 Chestnut St., Philadelphia, Pa. It is devoted to a discussion of the advantages of anthracite over competing fuels, and contains data on the design and planning of boiler rooms, and the selection of type of heating system. Stokers, forced draft for burning anthracite, and automatic control of anthracite combustion are described and illustrated. Considerable data are given to show the saving possible when burning anthracite as compared with oil and gas. Heat loss tables, radiator capacity and dimension tables, and flue sizes and chimney heights are presented.



A Complete Line of Expansion Joints

An interesting use to which a Badger Self-Equalizing joint has been put is that of a brine line. The joint functions as a "contraction" rather than an expansion joint.

IF your pipe line expansion problem involves only low pressures, Badger has the corrugated joint you need.

If the problem is a high pressure job —150, 175, 200 pounds, or higher —Badger has the joint. A pack-less joint with corrugations protected by self-equalizing rings.

Or possibly, it is superheated steam with which you have to contend. Here, is the place for the joint with the corrugations that are protected by the Monel metal lining.

In short, Badger has a complete line of flanged end or welding type expansion joints, standard types ranging up to 30" in size. In this complete line you can find the joint needed for handling your problem.

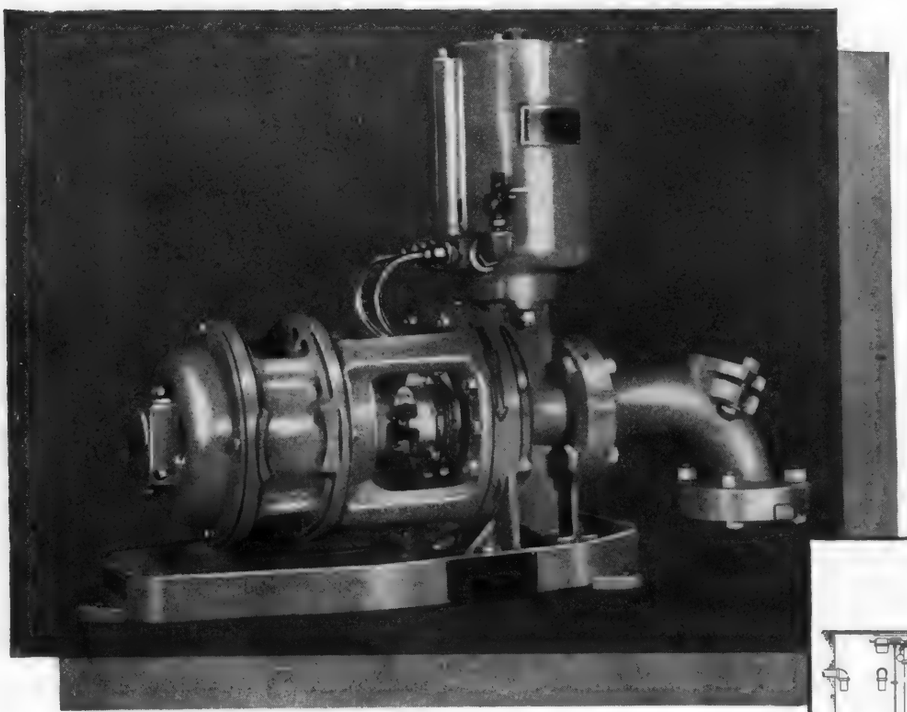
E. B. BADGER & SONS COMPANY

67 Pitts Street, Boston, Mass.

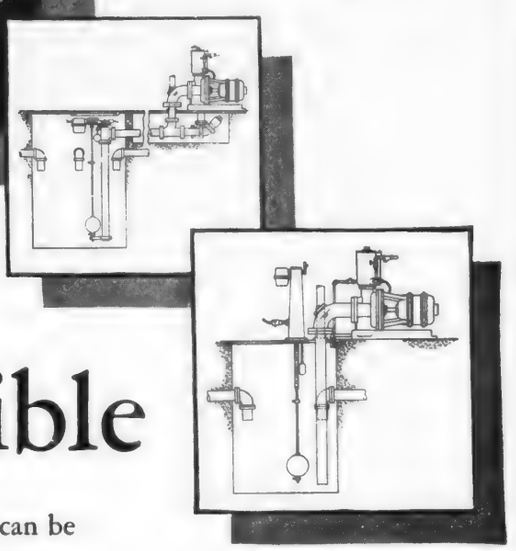
New York, N. Y., 271 Madison Ave.
Syracuse, N. Y., 404 S. Clinton St.
Minneapolis, Minn., 716 Builders Exchange
Charlotte, N. C., 1408 Realty Bldg.
Denver, Colo., 414 W. Colfax Ave.
Chicago, Ill., 2831 S. Parkway
Cleveland, Ohio, Guardian Bldg.
Cincinnati, Ohio, Union Trust Bldg.
Atlanta, Ga., Red Rock Bldg.
Salt Lake City, Utah, Kearns Bldg.
Philadelphia, Pa., 1500 Walnut St.
Detroit, Mich., 1728 Ford Bldg.
St. Louis, Mo., 3605 Laclede Ave.
Houston, Texas, 1308 Second Nat. Bank Bldg.
San Francisco, Cal., Sharon Bldg.
Pittsburgh, Pa., Union Trust Bldg.
Montreal, Quebec, Canada Cement Bldg.
Los Angeles, Cal., 517 Hollingsworth Bldg.
Portland, Ore., 1000 Buyers Bldg.
Seattle, Wash., 4 5 Lenora St.

BADGER EXPANSION JOINTS

ESTABLISHED 1841 · WEATHER VANE ON FANEUIL HALL · E.B. BADGER & SONS COMPANY · TRADE MARK



Jennings Suction Sump Pumps are furnished in standard sizes with capacities ranging from 30 to 250 g.p.m. Heads up to 60 ft. Bulletin 97 gives complete information. Write for a copy.



Easily installed ... always accessible

THERE is just one way that the ordinary sump pump can be installed. The pump must be placed in the pit, the motor directly above. Often this proves awkward and inconvenient.

The Jennings Suction Sump Pump is so designed that only its suction pipe need be submerged. A bronze air rotor, mounted on the same shaft with the water impeller, permits the assembly to handle air or gas, along with seepage, without becoming air bound or losing its prime.

The advantages of this arrangement are obvious. The Jennings Suction Sump and its driving motor are placed outside the pit and can be installed either nearby or removed from it. Space above the pit may be left vacant for other uses. All moving parts are above the floor level where they are always accessible. In addition, the pumping unit is so constructed that the impeller is removable, for inspection or cleaning, without breaking any pipe connections or disturbing shaft alignment.

RETURN LINE AND AIR LINE VACUUM HEATING PUMPS—CONDENSATION PUMPS—COMPRESSORS AND VACUUM PUMPS FOR AIR AND GASES—STANDARD AND SUCTION CENTRIFUGAL PUMPS—HOUSE SERVICE PUMPS—SEWAGE EJECTORS—SUMP PUMPS—FLAT BOX PUMPS—MARINE PUMPS

Jennings Pumps

THE NASH ENGINEERING CO. 81 WILSON ROAD, SOUTH NORWALK, CONN.

Trade and Miscellaneous Notes

Coming Events

October 7-10, 1929. Third National Fuels Meeting in Philadelphia, Pa. Headquarters at the Bellevue-Stratford Hotel.

October 14-18, 1929. Eleventh annual convention of the American Gas Association at Atlantic City, N. J. Headquarters at Municipal Auditorium.

December 2-6, 1929. Annual meeting of the American Society of Mechanical Engineers in New York. Headquarters at the Societies' Bldg., 29 West 39th St.

December 2-7, 1929. Eighth National Exposition of Power and Mechanical Engineering in New York. Headquarters at the Grand Central Palace.

January 27-31, 1930. Annual meeting of the American Society of Heating and Ventilating Engineers, Philadelphia, Pa. Headquarters at the Benjamin Franklin Hotel.

January 27-31, 1930. International Heating and Ventilating Exposition at Philadelphia, Pa., at the Commercial Museum.

April 7-12, 1930. Seventh annual convention of the American Oil Burner Association in Chicago, Ill. Headquarters at the Hotel Stevens.

Air-Way Purchases Erie Heating Systems

Air-Way Electric Appliance Corp., Toledo, O., has purchased the entire business of Erie Heating Systems, Inc., Erie, Pa. The Erie industry has been removed to Toledo and housed in extensive additions to the Air-Way plant, which is one of the outstanding industries in America. The addition of large quantities of new manufacturing equipment, and the commencement of big volume production of Air-Way unit heaters, as the former Erie heater is now called, means that the production and distribution of these heating systems will be carried on in a big way by the Toledo concern.

"Flush-Kleen" Ejectors in Japan

It has been cited that the progressive attitude of the Japanese has evidenced itself in the fact that the same materials and methods which are used in new buildings in this country are being used in new buildings over there. A recent report states that in the new Nomura Bank, in Tokio, "Flush-Kleen" ejectors have been installed. This new type of sewage ejector uses the flow reversal principle.

New Johnson Oil Burners Listed by Underwriters

Johnson Type 26-A and Type B, fully automatic, rotary oil burners, built by the S. T. Johnson Co., Oakland, Calif., have been listed by the Underwriters' Laboratories to burn No. 3 oil. Labels will be supplied for either of these types using gas or electric ignition.

Home Modernizer Becomes Monthly

"To spread the gospel of modernization and ... to assist the building industries of this country to dispose of their products to those who need them most," *Home Modernizing Activity*—which had been a twice-a-month house organ—published its first issue as a monthly when *The Home Modernizer* for June, 1929, appeared.

Miscellaneous Items

August building operations, as reported by the F. W. Dodge Corporation, show a decline of 25% from the total for July and 5% from the total for August of last year. The total figures for the 37 states east of the Rocky Mountains were $488,882,400. Analysis of this record shows that 30% of all construction was for residential buildings, 24% for public works and utilities, 15% for industrial buildings, 15% for commercial buildings, and 7% for educational buildings.

Contracts in New York State and Northern New Jersey amounted to $94,506,000, representing the lowest total for August since 1924. This was a decline of 57% as compared with July, 1929, and a decline of 26% from the total for August, 1928. In the New England States figures amounted to $33,459,900, showing a decrease of 21% below the preceding month, and 14% below the total for August of last year.

In the Middle Atlantic States contracts amounted to $45,595,600, a decrease of 39% when compared with the preceding month, and a decrease of 11% from the total for August of last year. Contracts in the Pittsburgh District amounted to $67,014,600, representing an increase of 2% over the total for last month, and 17% over the total for August of last year.

Figures in the Central West amounted to $153,170,800, representing a decrease of 4% from the total for the preceding month, and 8% from the total for August, 1928. In the Northwest, contracts amounted to $8,303,100, showing a decrease of 6% from the July total, and 20% from the August, 1928, total.

Contracts in the Southeastern States amounted to $68,860,100, representing an increase of 30% over July, and 41% over the total for August of last year. Texas reports contracts amounting to $17,972,300, showing a decrease of 35% when compared with the total for July, but representing an increase of 4% over August, 1928.

Fire Prevention Week has been scheduled by the N.F.P.A. for October 6-12. The association has prepared supplies of posters and other material for general use. Speakers for Fire Prevention Week are in the hands of T. Alfred Fleming, chairman of the N.F.P.A. Committee on Fire Prevention and Clean-Up Campaign, 85 John St., New York.

G. H. Rittenhouse, for four years director of sales of the International Burners Corporation of New York, has resigned, effective October 1.

Esten Bolling, technical publicity and sales development engineer, formerly at Box 46, East Orange, N. J., has moved to Mountain Lakes, N. J. Telephone number is Boonton 939.

E. O. Eastwood, professor of the University of Washington, Seattle, has been appointed director of the Guggenheim Aerodynamic Laboratory and was placed in charge of instruction in that department in the University of Washington.

Manufacturers' Notes

Bishop & Babcock Sales Co., Cleveland, O., announces the appointment of Cooper Pogue, 930 Chamber of Commerce Bldg., Cincinnati, O., as its sales representative in Southwestern Ohio and Central Kentucky.

Sundstrand Engineering Co., Rockford, Ill., has appointed the following dealers for the sale of the Sundstrand oil burner: Deal & Son, 1817 West Main St., Kalamazoo, Mich.; Klag & Son, Tonica, Ill.; Hunter-Prell Co., 311 Elm St., Battle Creek, Mich.

Link-Belt Co., Chicago, Ill., announces the resignation of F. B. Caldwell, vice-president of the Chicago plant, on ac-

count of ill health. W. C. Carter, formerly vice-president in general charge of production at all Link-Belt plants, will assume the duties of vice-president and general manager of the Chicago plant. E. J. Burnell, formerly manager of the Pittsburgh office, has been appointed sales manager of the western division, with headquarters at the Chicago plant. Nels Davis, formerly of the Chicago engineering sales force, succeeds Mr. Burnell as the manager at Pittsburgh.

Gorton Heating Corp., 96 Liberty St., New York, has appointed Wallace J. Snow as its Cleveland sales representative for the Gorton single pipe vapor heating system and Gorton quarter turn packing lock radiator valves, with headquarters at 420 United Bank Bldg., Cleveland.

Time-O-Stat Controls Co., Elkhart, Ind., has appointed Gerald E. Spates to take charge of the Detroit office located at 4270 Second Boulevard. Mr. Spates, for the past three years, has been sales engineer at the factory. Carl A. Scholle, who recently was placed in charge of the New York office, will devote his entire time to the distributing organization, and will travel direct from the home offices. Ray G. Schott has been appointed manager of the New York office located at 11 West 42nd Street. Recent appointments of new distributors are: Braid & Haberkorn, Inc., 940 Speer Blvd., Denver, Colo.; J. H. Lym, 724 McIntyre Bldg., Salt Lake City, Utah; Cline Co., 535 W. Main St., Oklahoma City, Okla.; J. Sylvan Bowers, Heating Specialty Co., 3805 Page Blvd., St. Louis, Mo.; Northwest Time-O-Stat Distributors, 2707 E. Lake St., Minneapolis, Minn.; American Appliance Co., 1214 Harvey St., Omaha, Nebr.

Brownell Co., Dayton, O., has appointed the International Engineering & Supply Co., St. Louis, Mo., as its exclusive sales representative for Brownell boilers in St. Louis and surrounding territory. This company also represents the Illinois Engineering Company, and is taking on the Brownell boiler line in addition to their other specialties. Recent expansion of their business required that a mechanical engineer be employed and H. E. Jacobsen, of Chicago, was appointed chief engineer.

Texo Heater & Mfg. Corporation, the new name of Texo Sales Co., Inc., formerly of Cincinnati, O., opened its new plant at 220-230 Madison Ave., Covington, Ky., September 28.

Electrol, Inc., St. Louis, Mo., has signed a contract with Commercial Investment Trust Corporation, through its subsidiary Commercial Investment Trust Incorporated, for the financing of the time sales of authorized Electrol dealers.

Carrier Engineering Corp., Newark, N. J., through its vice-president and general sales manager, E. T. Murphy, announces the removal of its sales division from 39 Cortlandt St., New York, to the main offices and laboratories at 850 Frelinghuysen Ave., Newark. The New York territorial sales office, under the direction of E. T. Lyle, remains in the quarters which have been occupied since the organization of the company at the Cortlandt street address.

Winslow Boiler and Engineering Co., Chicago, announces that Edward C. Glock has become sales manager of Dubin & Co., Inc., distributors of Kleen-Heet oil burners in Connecticut. Mr. Glock, for the past four years, has been connected with the Super Oil Burner Company.

Roberts-Gordon Appliance Corp., Buffalo, N. Y., manufacturer of gas conversion units, announces that its sales and distribution organization has taken over the entire selling activity connected with the products of the Duplex Heating Company. The Duplex line consists of straight gas-fired equipment for nearly every purpose, including units for private homes, apartments, hotels, large buildings, garages and industrial plants.

Rome Brass Radiator Corp., 1 East 42nd St.., New York, announces the appointment of Victor M. Lathers as district representative and sales engineer for the State of Missouri with headquarters at 354 Paul Brown Bldg., 818 Olive St., St. Louis.

Chicago Mill & Lumber Corp., Chicago, Ill., has appointed Edgar W. Morrill as technical service director of its insulating board division. Mr. Morrill formerly was connected with the Insulite Company. Another appointment by the insulating board division of the company is that of W. H. Badeaux, formerly secretary of the Northwestern Lumbermen's Association, to handle all sales west of the Mississippi River.

N. O. Nelson Mfg. Co., Duncan Ave., at Boyle, St. Louis, Mo., has opened its new administration building which will contain the general offices and city and country sales departments, with a large and modern displlay salon for heating materials, plumbing fixtures and home water works supplies.

Illinois Engineering Co., Chicago, Ill., has appointed the following representatives: F. C. Myers, Atlanta, Ga.; F. L. Bunker, Greensboro, N. C.; S. A. Roberts & Co., Salt Lake City, Utah, and Momsen, Dunnegan & Ryan, El Paso, Tex.

Sheffler-Gross Co., Drexel Bldg., Philadelphia, Pa., sales engineers, has acquired a substantial interest in the Delaware County Central Heating Co., at Springfield, Pa. This company will take over the operation of the old Springfield Heating Company which serves central heat to this territory.

Heating and Plumbing Finance Corp., 37 West 39th St., New York, announces that H. H. Brown, formerly special field representative, has been appointed manager of the Chicago office at 816 South Michigan Ave., to succeed R. L. Brentlinger, deceased. F. A. Smythe, formerly special field representative, has been appointed manager of the New York office.

Wagner Electric Corp., St. Louis, Mo., makes the following announcements: A new branch sales office has been established at 734 Allen Bldg., Dallas, Tex., to cover the entire state of Texas and parts of Louisiana and Arkansas, with Alfred B. Emerick in charge as manager. Mr. Emrick formerly was branch manager of the Pittsburgh office. James G. Pattillo, Jr., formerly salesman in the Pittsburgh branch sales office, has been appointed manager to succeed Mr. Emerick. J. B. Holston, formerly of the Chicago branch, has been transferred to serve as branch manager of the St. Louis sales office. Ralph R. Rugheimer is now a member of the Atlanta branch sales office.

Mueller Co., Decatur, Ill., held its annual picnic at Fairview Park, September 14, with an attendance of 5000.

Trane Co., LaCrosse, Wis., has opened offices at 405-6 Southeastern Trust Company Bldg., Atlanta, Ga., with Floyd E. Paird as manager and H. F. Casey as district engineer.

Changes of Address

The Allentown Kleen-Heet Sales Co., 833 Walnut St., Allentown, Pa., has moved its offices and showroom to 9 South 12th Street.

L. K. Ascher and Son, Board of Trade Bldg., Indianapolis, Ind., will move to new offices in Suite 1009-1013, Architects and Builders Building, about November 1.

Combustion Specialties Corp., New York, announces a change in address from 250 West 54th Street to 101-109 East 144th Street, where a new office and factory building has been erected.

Petroleum Heat and Power Co., Stamford, Conn., announces that its general sales offices, including the advertising and accounting departments and the newly merged Nokol division, are now located in its new plant No. 2 which has 185,000 sq. ft. of floor space. J. A. Dillon is in charge of the Nokol division of dealers and distributors; O. P. Harris is in charge of the engineering, service and sales schools, and Clark Jarrett, formerly representative for Williams Oil-O-Matic Corporation in Wisconsin, is on special duty work in the Atlantic seaboard territory for the Nokol division.

National Radiator Corp., Johnstown, Pa., has moved its Milwaukee headquarters and now is established in its new modern warehouse, showroom and offices at 2003-9 St. Paul Avenue.

Notre Dame Academy, Tynesborough, Mass.
Architect: Edward T. P. Graham, Boston
Heating and Ventilating Engineers. J. E. Carroll Company, Lowell, Mass.

A BEAUTIFUL SCHOOL

. . . WELL HEATED
. . . WELL VENTILATED
. . . FREE FROM DRAFTS

The Notre Dame Academy at Tynesborough, Mass., provides a good example of the economy and comfort of Unit Heater-Ventilators in school work.

In this stately building Sturtevant Unit Heater-Ventilators provide a particularly satisfactory air condition all the year 'round.

These units draw in—from out-of-doors—controlled quantities of air; filter it clean; warm it to the desired temperature and introduce it into the classrooms noiselessly, safely—without the hint of a draft.

Sturtevant Unit Heater-Ventilators are compact, handsome in appearance and SILENT. They can be used in old and new buildings—no expensive duct work necessary.

It would be a pleasure to send you a new Data-Catalog showing many actual installations in schools, public buildings, clubs, churches, offices, showrooms, shops and residences. It is a helpful book . . . our nearest Branch Office will gladly mail you a copy.

B. F. STURTEVANT COMPANY

Plants and Offices: Berkeley, Cal. ∿ Camden, N. J. ∿ Framingham, Mass. Galt, Ontario ∿ Hyde Park, Mass. ∿ Sturtevant, Wis.

Branch Offices at: Atlanta; Birmingham; Boston; Buffalo; Camden; Charlotte; Chicago; Cincinnati; Cleveland; Dallas; Denver; Detroit; Hartford; Indianapolis; Kansas City; Los Angeles; Milwaukee; Minneapolis; Newark; New York; Omaha; Pittsburgh; Portland; Rochester; St. Louis; San Francisco; Seattle; Washington, D. C. ∿ *Canadian Offices at:* Toronto; Montreal and Galt. ∿ *Canadian Representative:* Kipp Kelly, Ltd., Winnipeg.
Also Agents in Principal Foreign Countries

Sturtevant *the Silent* Unit Heater-Ventilator

Reg. U. S. Pat. Off.

SUPPLIES OUTDOOR AIR ∿ FILTERED CLEAN ∿ AND TEMPERED

Classified Advertising

Advertisements under this heading, $2 per inch, payable in advance. A 1-in. advertisement contains 35 words. To secure insertion copy must be received not later than the 20th of the month preceding date of issue.

HEATING AND VENTILATING — 521 5th Ave., New York City.

PRECISION

is a synonym for our service when we are mentioned by the Heating and Ventilating industry. The exactness of our operating methods in research has been given the stamp of national recognition by those whom we have served in the past.

All branches of Heating, Ventilating, Air Conditioning, District Heating and allied problems find ready reference in our completely equipped Laboratories.

Correspondence from manufacturers, architects and engineers is cordially invited, and assurance is given of our fullest co-operation.

FROST
RESEARCH LABORATORY
Incorporated
1326 MARKLEY STREET
NORRISTOWN PENNSYLVANIA

HEATING and VENTILATING Sales Engineers with successful sales experience in fan industry wanted. Address application to Box 76, Heating & Ventilating

BUILDING SERVICE ENGINEERS & DESIGNERS WANTED

Stone & Webster Engineering Corporation has several desirable openings for building service engineers and designers. Men with a thorough knowledge of heating, ventilation, plumbing and fire protection requirements for power stations, industrial plants and office buildings, are desired. Engineers should have experience and training which qualifies them to supervise, design, prepare specifications and purchase materials. Designers should be qualified to handle design and computations and to prepare working plans. Apply in writing to Stone & Webster Engineering Corp'n, 49 Federal St., Boston, Mass., enclosing recent photograph and record of personal history and experience.

BIG BUSINESS SAYS!

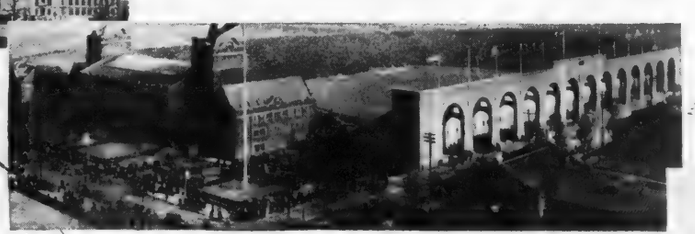
"Prepare NOW to reap YOUR share in the coming years of great business Prosperity."

HARKEN to this Command, O Ye Shop Owners, Salesmen, Mechanics, and others. Fortunes will be made in these next few years by those who KNOW. Devote this Winter to personal preparation in a technical way for going after the bigger paying jobs—the ones with the larger yearly incomes. Build big with big prosperity; our Engineering Service is at your command. Check the subject you prefer, and mail today—full information is free.

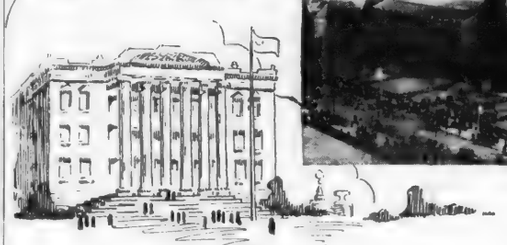
- ☐ Heating and Ventilating Engineering.
- ☐ Special Steam and Water Heating.
- ☐ Scientific Warm Air Heating.
- ☐ Plumbing and Sanitary Engineering.
- ☐ Contracting and Estimating.
- ☐ Mechanical Drafting.

Saint Louis Technical Institute
Est. 1910.
The most thorough institution for Technical Home Study to-day.
4543 Clayton Avenue St. Louis, Mo.

back to school and college go the young folks



U. of P. Stadium, Day & Klauder, Architects.



Harvard Medical School, Shepley, Rutan and Coolidge, Architects, Densmore LeClear and Robbins, Engineers.

The perfection of the equipment in the buildings which they will use for the next eight months, is a tribute to the foresight of the architects and engineers.

Martin Maloney Medical Clinic, University of Pennsylvania, Tilden, Register & Pepper, Architects.

Perfection of one detail in convenience and comfort—HOT WATER—is assured by the use of—WHITLOCK SERVICE WATER HEATERS.

A 'phone call to our nearest office—consult your local telephone directory under our name—will bring one of our Hot Water Engineers—who will gladly work with you.

NEW YORK · PHILADELPHIA BALTIMORE LOS ANGELES BOSTON CHICAGO DETROIT SAN FRANCISCO
and other principal cities. Consult telephone book.

The Whitlock Coil Pipe Company, 40 South St., Hartford, Conn.

. . . .Warm Air Furnace Control Outstanding Features That Merit Close Inspection.

MERCOID

M-51 FURNACE CONTROL

Note the simple High and Low Double Adjustment Mechanism. Also the Furnace Duct Temperature Indicator.

THE Mercoid M-51 Furnace Control is the latest development and a decided improvement in bimetal furnace control design.

The Double Adjustment feature permits its use over the wide range of operating conditions encountered with the various makes of furnaces.

The Duct Temperature Indicator shows the temperature in the furnace hood or duct, and serves a useful purpose.

All Adjustments are located within the case of the instrument, thereby eliminating the danger of accidental disarrangement or tampering with by unqualified persons.

The Adjustable Flange makes it possible to place the instrument in different positions and on surfaces having a 45 degree angle or less.

The control is compact and neat in appearance.

It is the ideal control for all automatic warm air furnace control requirements. Write for complete Bulletin S-83.

Good business now awaits Dealers on the sale of these controls.

THE MERCOID CORPORATION

564 West Adams St., CHICAGO, ILL.

NEW YORK OFFICE, 25 Church St., New York, N. Y.

MERCOID CONTROLS

The Pines Winterfront Company, Chicago, Illinois

The roof of the new Pines Winterfront Company plant at Cicero and Division Streets, is completely insulated with 200,000 square feet of Celotex Roof Insulation Board, applied in two layers over a concrete roof deck. Mundie & Jensen, Architects. U. S. Scown Construction Company, General Contractors. Luse Stevenson Company, Roofing Contractors.

STOP FUEL WASTE

Prevent Ceiling Condensation

with Celotex Roof Insulation Board

ROOF insulation is recognized as a necessity in modern industrial plants. And in hundreds of buildings, engineers have specified Celotex Roof Insulation Board because of its low heat conductivity and small application cost.

Celotex-insulated roofs prevent costly losses of heat and waste of fuel throughout the winter months . . . make it possible for buildings to be kept at productive working temperatures with smaller heating plants and less radiation.

Ceiling condensation and consequent rapid depreciation of buildings and equipment is eliminated . . . since Celotex provides warmer ceilings.

And in summer Celotex shuts out sweltering heat . . . maintains production at the peak in spite of extreme weather conditions.

Celotex Roof Insulation Board measures 2′ by 5′ with a thickness of approximately ½″ and laminated in multiples of from two to eight plies. The boards are quickly and easily applied to the roofs of new or old buildings . . . over wood, metal or concrete roof decks and under any type of roof covering. On old buildings they can be laid directly over the present built up covering, and then a new roof applied.

The important economies effected with Celotex-insulated roofs have been demonstrated time and again in practically every type of manufacturing plant.

Write for our folder *Dividends from Proper Roof Protection* containing carefully tabulated data on the actual savings in fuel and radiation that have been obtained with Celotex Roof Insulation Board.

Our own engineers will gladly cooperate with you in meeting any individual problem.

The word CELOTEX (Reg. U. S. Pat. Off.) is the trademark of and indicates manufacture by The Celotex Company Chicago, Ill.

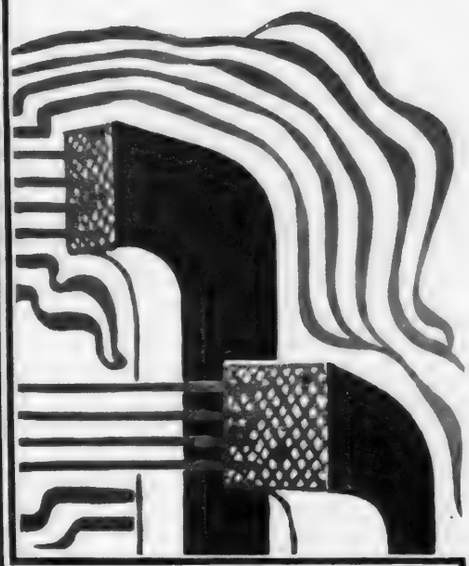
CELOTEX
BRAND
INSULATING CANE BOARD
INDUSTRIAL INSULATION

THE CELOTEX COMPANY
919 North Michigan Avenue
Chicago, Ill.

Mills: New Orleans, Louisiana
Branch Sales Offices in many principal cities (See telephone books for addresses)
Sales Distributors throughout the World

In Canada:
Alexander Murray & Co., Ltd., Montreal

ELIMINATE NOISE *by Isolating Machines*



UNDESIRABLE noise from motors, pumps and fans can be stopped by cushioning the machinery on Armstrong's Cork Machinery Isolation.

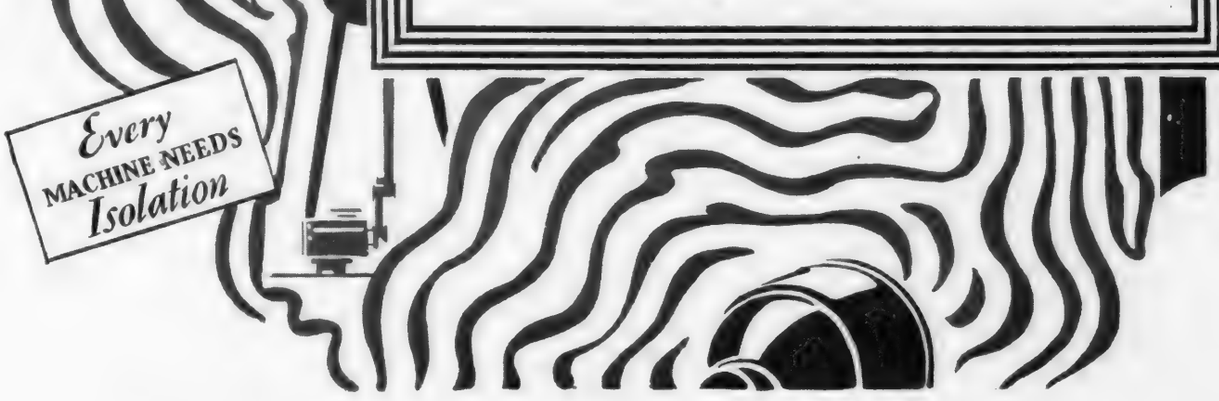
Armstrong's Machinery Isolation is made of pure granulated cork, and is permanently strong in structure, damp and moisture-proof, easy to install and inexpensive. It is furnished in sheets which, because of the carefully controlled process of manufacture, are of uniform density throughout. It will never pack down, harden or loose its resilience.

Elimination of noise and vibration with Armstrong's Cork Machinery Isolation is of inestimable value in apartment houses, hospitals, hotels, offices and factory buildings.

Counsel on machinery isolation is freely furnished by Armstrong Engineers. Address Armstrong Cork & Insulation Company, 925 Concord St., Lancaster, Pa.; McGill Building, Montreal; 11 Brant Street, Toronto.

Armstrong's Ⓐ *Cork* MACHINERY ISOLATION

EVERY BOARD TRADEMARKED



INSULITE

the Wood-Fiber Insulating Board

ELIMINATES COSTLY REPAIRS

~Reduces Maintenance Expense

IF A break or a leak occurred in one of your roof insulation jobs, would it be necessary to tear up a large section of the roof to successfully repair the damage? Not if it's Insulite—because this material has a full ship lap edge all around—is cut in units of convenient size (17"x34"), and if accidently damaged the injured section can be economically replaced without disturbing any other part of the roof.

The ship lap edges of Insulite Roof Insulation overlap, and are laid in a bond of pitch or asphalt . . . there are no uninsulated spaces . . . the roof is heat *sealed*. And here's an important fact—should one unit become damaged moisture cannot seep from that unit into adjoining units, thus impairing the insulating efficiency of a large area and making extensive repairs necessary.

And remember, Insulite Roof Insulation is built with two panels of ½ inch Insulite firmly stitched together with non-corroding steel wire. The completed slab is a full inch thick—this means 12½% more efficient insulation than ordinary ⅞ inch insulating boards.

Insulite is an all wood product, chemically treated to resist moisture and is not subject to deterioration. Insulite has great tensile strength which makes it easy to handle and eliminates loss from breakage.

Insulite has many other features and advantages well worth inquiring about. Let us send you complete information.

SEND FOR THIS BOOK

The Engineering Department of The Insulite Company has prepared a booklet, "Roof Insulation and the Prevention of Condensation." It contains much valuable data. We will gladly send you a copy free—and remember, our Engineering Department is at your disposal at any time. You are obligated in no way.

THE INSULITE COMPANY
(A Backus-Brooks Industry)
1200 Builders Exchange, Dept. 29J
Minneapolis, Minnesota

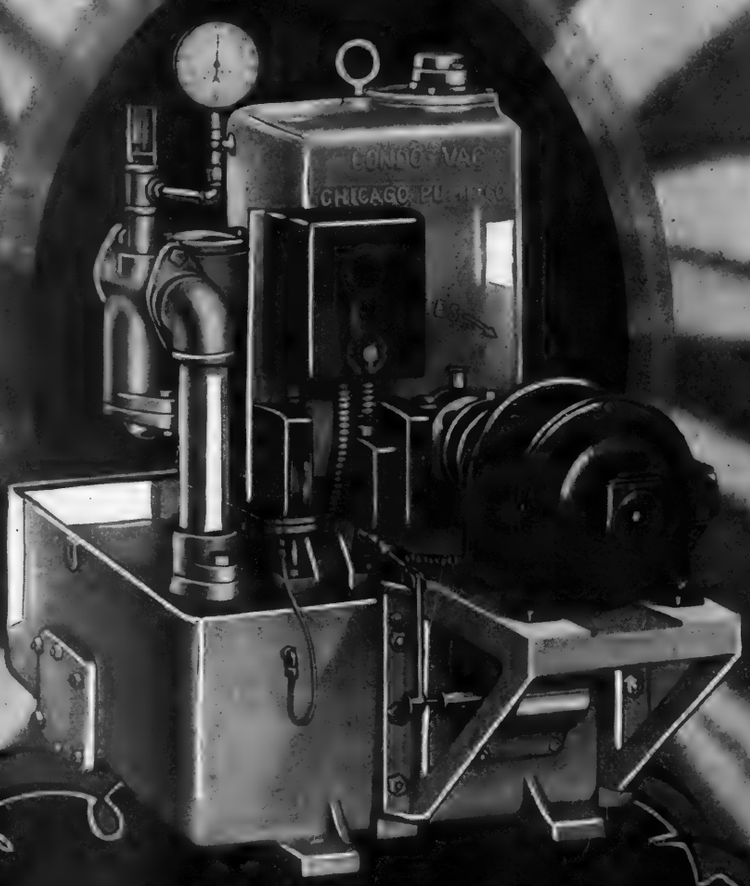
Insulate with

FULL ½ INCH THICK
RESISTS
COLD-HEAT-NOISE

INSULITE
the Wood-Fiber Insulating Board

OFFICES
IN ALL
PRINCIPAL CITIES

CONDO-VAC



. . . . . The "Condo-Vac" is built as a Return Line Condensation Vacuum Pump or as a Vacuum Pump for Industrial purposes. . . . "Condo-Vac" is superior in these points: [1] No vacuum or pressure on stuffing boxes of air or water pumps. [2] A low inlet, only 9 inches from floor. [3] Horizontally split pump casing allows easy access to pump parts.

Details are complete in Bulletin 137—Ask for it.

CHICAGO PUMP COMPANY

SEWAGE-CONDENSATION-CIRCULATING
BILGE-FIRE-HOUSE-VACUUM

2336 Wolfram Street, Chicago 79 Madison Avenue, New York

The Capitol 40 inch Series Smokeless Boiler

Especially recommended where foundations are cut in rock

Savings in construction costs alone often go far toward paying for the entire heating plant when a Capitol 40-inch series smokeless boiler is chosen.

Such a statement may be hard to believe until you realize that this boiler has a 49 inch water line. Thus is permitted installation in rooms with particularly low ceilings, with no pit or base section required.

Especially marked is the resultant building economy when water in the basement must be guarded against or when foundations must be cut in the rock.

But perhaps still more important among the advantages that lead us to recommend it for buildings whose foundations are cut in rock is the efficiency and economy with which it burns any bituminous coal or lignite, giving fuel savings and satisfactory performance every day of its life. And the generally sturdy tested construction that enables it to stand up and serve for years and years and years.

UNITED STATES RADIATOR CORPORATION - DETROIT, MICHIGAN

8 Factories and 34 Assembling Plants Serve the Country • For 39 Years Builders of Dependable Heating Equipment

THE PACIFIC STEEL BOILER CORPORATION

Division of the United States Radiator Corporation, builds welded steel heating boilers for large installations—business buildings, factories, schools, hotels, and large apartments

Guaranteed Heating WITH

Capitol Boilers

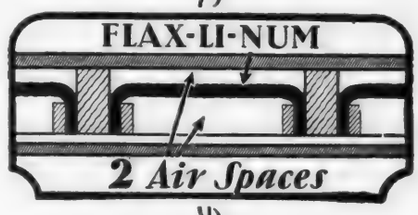
AND RADIATORS

HAS ANY METHOD OF INSULATION EVER RECEIVED A . . .

FINER TESTIMONIAL

THAN THIS . . .

If a layer of material is placed in the middle of a wide air space such as that between the studs in a frame wall, greater additional insulating value is obtained than if the material is placed in contact with the sheathing, or as a plaster base, as has been assumed in the calculation for table (3). In the former case the insulating layer not only furnishes its own insulating value, but in addition divides the air space into two parts, each of which has about the same insulating value as the original air space. The insulating value of an ordinary air space more than about one inch in width is equivalent to about ¼ inch of insulating material. The addition of a half-inch layer of insulation in the middle of the air space in a frame wall is therefore the equivalent of adding about a ¾ inch layer at some other place in the wall. — Department of Commerce, Bureau of Standards, Washington, D. C., Letter Circular L. C. 227.



The FLAX-LI-NUM Insulating Company is not interested in producing an insulating material merely for the sake of being engaged in a manufacturing process. It is interested only in producing an insulating material which when applied according to specifications will make possible greater protection from heat and cold — greater year around home comfort — and greater fuel economy.

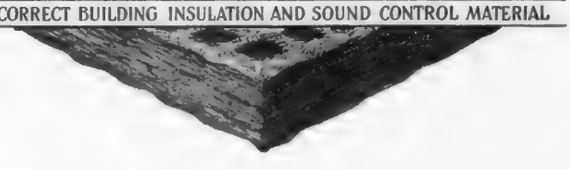
Science has proven that the greatest insulating value is possible only when the material is designed for and used as insulation alone. *Therefore* FLAX-LI-NUM is a single purpose material.

Science has also proven that the air spaces between the walls can be efficiently utilized. *Therefore* FLAX-LI-NUM was designed to be applied by the "two-air-space" method . . . In other words FLAX-LI-NUM is a scientifically correct insulating material plus a method of application. Its greater insulating value is fully in keeping with finer, sounder principles upon which it it based—and when the facts are laid on the table, few dare tread upon the ground that has for so long, been the reason for FLAX-LI-NUM'S continued superiority.

FLAX-LI-NUM INSULATING CO., *St. Paul, Minn.*

Flax-li-num

A CORRECT BUILDING INSULATION AND SOUND CONTROL MATERIAL



FLAX-LI-NUM INSULATING COMPANY HV-10
St.. Paul, Minnesota

Send me complete information about Flax-li-num. Also facts about the 2-air-space method.

Name.....

Address.....

City.....

State.....

VENTO

CAST IRON HEATERS

WESTERN UNION BUILDING . . . . . NEW YORK CITY
B. F. Sturtevant Company, *Blower Equipment.* . . Voorhees Gmelin & Walker, *Architects,* New York
Meyer Strong & Jones, *Consulting Engineers,* New York. . . Almirall & Co., Inc., *Heating Contractors*

The new Western Union Building, now under construction in New York City, will be equipped with 20,802 sq. ft. Vento Cast Iron Heaters.

This installation adds one more outstanding building to the already impressive list of American Skyscrapers that are Vento equipped.

For 25 years Vento has been the growing choice of heating engineers. And in all the millions of sq. ft. of Vento now in operation there is not one known instance of failure.

AMERICAN RADIATOR COMPANY

816 South Michigan Avenue, Chicago 40 West 40th Street, New York, N. Y.

De Bothezat Giant Fans —the Leviathan of Fans

A product of science

Designed and built in a true engineering way

Sizes from 5′ to 10′

Powers from 2 HP to 100 HP

Volumes from 24,000 C.F.M. to 250,000 C.F.M.

Static pressure from ¼″ to 3″

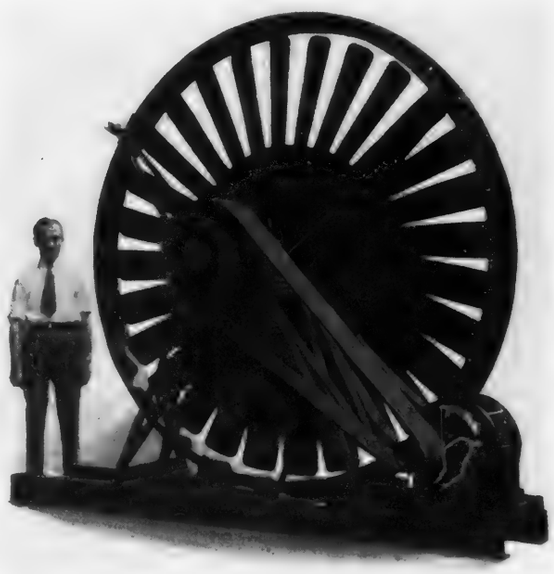
Speeds from 175 R.P.M. to 700 R.P.M.

Fan and motor mounted on the same base securing perfect alignment

Chain driven, texrope drive or direct connected

Requires a minimum floor space

DE BOTHEZAT PRESSURE FANS are well known for their high efficiency. They are the only fans in the world with non-overloading motor characteristics.



DE BOTHEZAT IMPELLER CO.

1922 Park Avenue, New York City

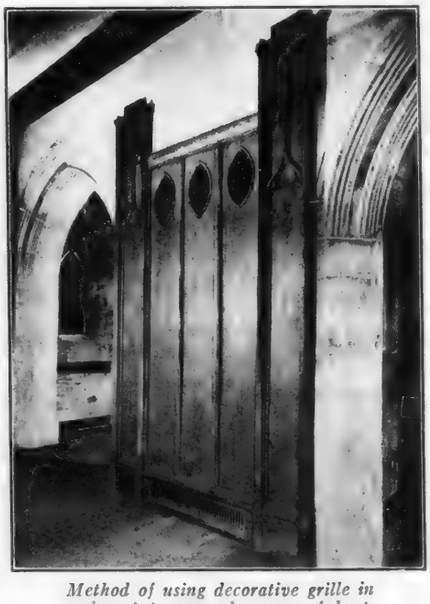
Nave of St. Paul's Church looking towards the entrance, Chestnut Hill, Pennsylvania
Zantsinger, Borie & Medary, Architects. Isaac H. Francis, Engineer. P. Gormly Co., Heating Contractors

How Can ROBRAS 20-20 RADIATORS Be Used To Provide HIDDEN HEAT In A Church

Heating a church with ROBRAS 20-20 Radiators in the wall, out of sight, and out of the way, can be accomplished in a number of ways. Illustrated here, however, is one of the most ingenious methods.

ROBRAS 20-20 Radiators were installed in the shallow space back of the wainscot and in the wall under the windows, in each of the window recesses. Air is admitted to the radiators behind the wainscot by inconspicuous floor grilles. The heated air is discharged by decorative grilles high up on the wainscot. By this method, two things are accomplished. High draft heat is obtained and the grilles are inconspicuous.

Additional radiation was provided by enclosing ROBRAS 20-20 Radiators in the end walls. The heated air is discharged by vents such as are visible by the door.



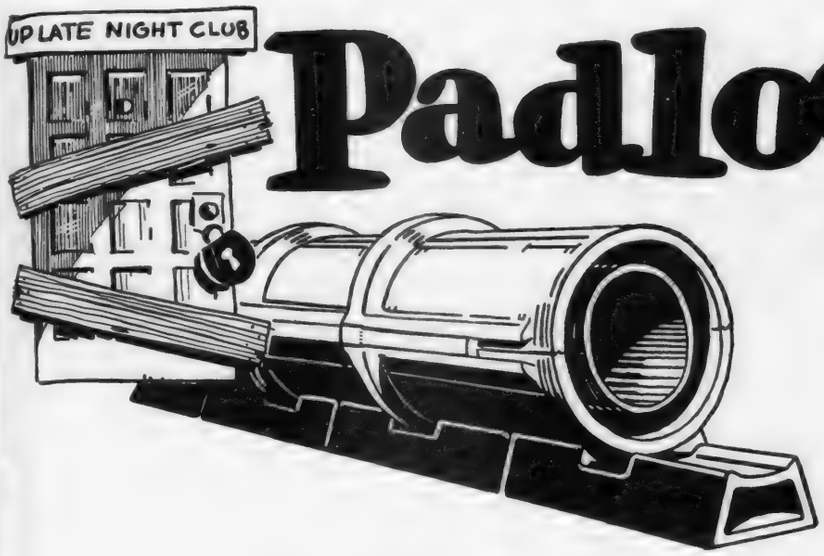
Method of using decorative grille in wainscot to conceal source of heat.

ROBRAS 20-20 Radiators so accelerate the circulation of air that the air directly under the roof and at the floor level, is more nearly the same temperature than is possible with any other type of radiation.

Another advantage of this more rapid circulation, is that the entire church is more quickly heated, once the heat is turned on. It is a flexibility of assembly of these radiators that makes it possible to use them in a place of almost any shape or size. They are adaptable.

Price lists and data sheets, are ready to be sent you as soon as we have your name.

ROME BRASS RADIATOR
CORPORATION
ONE EAST FORTY-SECOND STREET ❦ NEW YORK CITY



Padlocked!

It's an even more Effective Lock That makes Ric-wiL Conduit Dry

—and here's the Lock

The Loc-liP Side Joint which locks top and bottom halves of conduit together, restoring strength of split tile.

WHEN Ric-wiL engineers perfected the Loc-liP Side Joint they made tile conduit the best method of insulating underground steam lines.

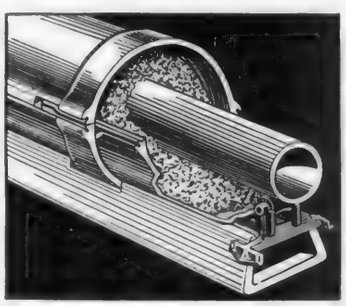
For tile is the most permanent material for underground use. Ric-wiL already was made of tile, everlasting, rugged, and safe. There was already Ric-wiL Base Drain Foundation, to support and strengthen the conduit and keep the ditch dry. And Ric-wiL Pipe Supports that kept the pipe load off the tile. With the Loc-liP Joint, the split tile could at last be resealed, and top and bottom halves actually locked together, moisture-tight — and to stay.

Now Ric-wiL Tile Conduit has all the advantages of every other kind—and many more. No subtrench needed. One grading job — the trench bottom. No special construction; you can be back-filling a Ric-wiL line by the time concrete or building tile work is getting started. For you handle only 3 pieces to each two feet of conduit. One man can set 30 Ric-wiL pipe supports per hour. And if you ever have to repair a steam pipe, you can get into and out of Ric-wiL with a minimum of trouble.

Also in recent tests Ric-wiL efficiency has been averaging from 92% to 94%. And its cost is usually less installed than ordinary conduits.

It will be well worth your while to get the Ric-wiL proposal on your next job.

Assisted by Dry-paC



And if the insulation locked inside the conduit is Ric-wiL Dry-paC all danger from leaks, from inside or outside, is completely done away with. Dry-paC makes Ric-wiL the last word in dry efficiency.

The Ric-wiL Company

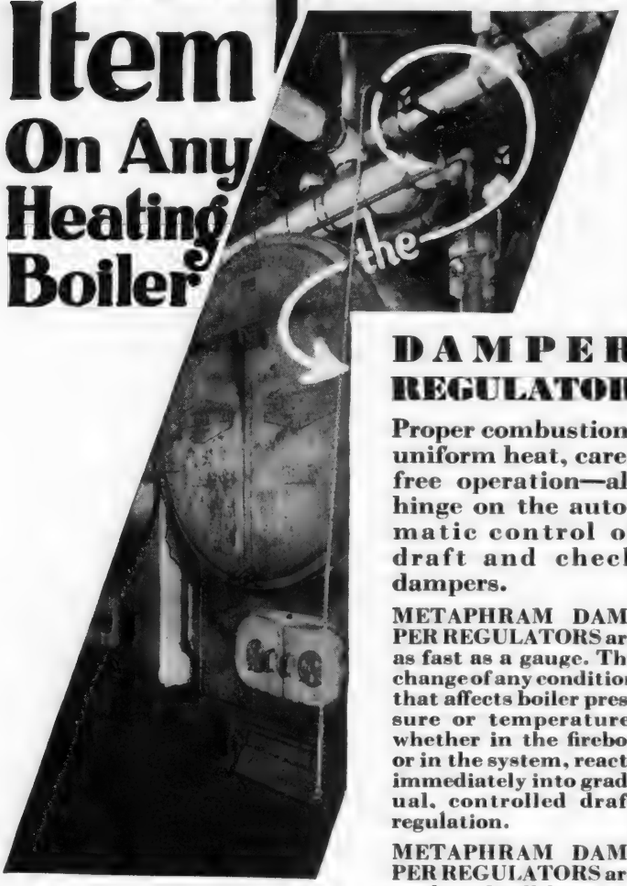
1567 Union Trust Bldg. Cleveland, Ohio

NEW YORK - BALTIMORE - ATLANTA - CHICAGO

Originators of Waterproof Conduit Filler

UNDERGROUND CONDUIT

An Important Item On Any Heating Boiler



DAMPER REGULATOR

Proper combustion, uniform heat, carefree operation—all hinge on the automatic control of draft and check dampers.

METAPHRAM DAMPER REGULATORS are as fast as a gauge. The change of any condition that affects boiler pressure or temperature, whether in the firebox or in the system, reacts immediately into gradual, controlled draft regulation.

METAPHRAM DAMPER REGULATORS are made to fit *all* domestic heating boilers—hot water, low pressure steam, vapor or vacuum; and they are a profitable item to the contractor for replacement of less efficient devices.

Detailed descriptive bulletins will be mailed on request.

NATIONAL

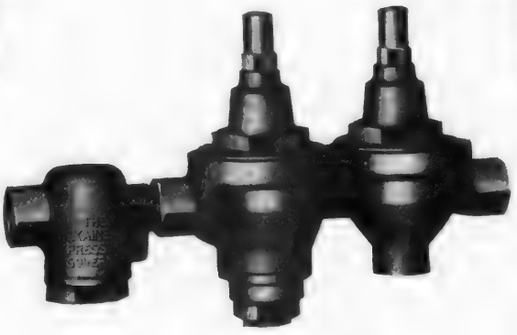
National Systems of Heat Regulation and Humidity Control, Metaphram Dampers, Metaphram Motors, Industrial Thermostatic Devices, A-Jacks Steam Damper Regulator for high pressure boilers, Metaphram Damper Regulators for domestic steam, vapor, vacuum and hot water heating boilers, Metaphram Furnace Regulators.

METAPHRAM

NATIONAL REGULATOR CO.
2309 Knox Ave. Chicago, Ill.

NATIONAL REGULATOR CO., 2309 Knox Ave., Chicago
Please send us
☐**Bulletin F-100—Type F Metaphram Damper Regulator for hot water boilers.**
☐**Bulletin LP-100—Metaphram Damper Regulators for low pressure boilers.**

Name .....
Address .....
Town ..... **State** .....



The KAINER PRESSURE GOVERNOR

for Hot Water Heating Systems

More and more plumbing and heating contractors and engineers are recommending and installing the KAINER Pressure Governor as it reduces the cost of a hot water layout, simplifies installation, makes a better job, saves your time and your customer's money, increases your profits and builds good will.

The KAINER Governor installed on any hot water heating system, old or new, eliminates the expansion tank with its dangers of freezing and overflowing; insures the user a cleaner system and better circulation with greater heating efficiency.

The rugged filter screen of perforated copper keeps out dirt and scale. The pressure reducing unit permits a full flow of water that quickly fills the system when first installed.

The KAINER Governor is extremely sensitive to any set pressure and thoroughly tested for all working pressures. It is factory adjusted to maintain 10 pounds on the system and to relieve the system at 30 pounds, but any desired change of adjustment or hair-line regulation of pressure is easily and quickly made by means of two simple adjustment screws.

Investigate TODAY the many advantages and sound sales points that meet with the instant response of prospects everywhere.

KAINER & COMPANY
CHICAGO
761-771 MATHER STREET
Manufacturers

K

150 Pounds Pressure CRANE VALVES 2500 Pounds Pressure

Radiator valve 113

Radiator valve 112

This new line of low type radiator valves, Nos. 112, and 113, will perform all the duties of steam radiator service in an unusually accurate and satisfactory way.

A new radiator valve

Crane Co. now offers to contractors a better channel of profit and an easier fitting to install... to the public, better and more efficient service... in this new line of radiator valves.

The points of design which substantiate this statement are:

Easier to install and repair—the bonnet has unusually convenient wrench flats. The renewable disc is held firmly against the forged brass slip on disc holder by means of a brass washer and nut.

Unusual strength and reliability—counterpieces, disc holders, tailpieces, tailpiece rings, and packing nuts are of forged brass.

Long service—packing rings in stuffing box are of braided asbestos.

Ease in operation—a molded composition handwheel connected to the top of the rolled brass stem responds instantly to force applied on it, and eliminates the danger of burned fingers.

Attractive—low and compact in type, this line of valves is unusually pleasing to the eye.

With their inheritance of the 74 years Crane prestige, their mechanical perfection and their appearance, this new line of radiator valves cannot help but conquer... create sales for piping contractors and make new friends for them.

CRANE

GENERAL OFFICES: CRANE BUILDING, 836 S. MICHIGAN AVENUE, CHICAGO
NEW YORK OFFICE: 23 W. 44TH STREET
Branches and Sales Offices in One Hundred and Eighty Cities

THERMO SYPHON TRAP

IF YOUR HEART STOPPED

YOU WOULD BE NO MORE DEAD THAN A HEATING SYSTEM EQUIPPED WITH AN UNCERTAIN TRAP . . . .

THERMO SYPHON TRAPS ARE POSITIVE

a trap that fails to deliver positive service in action is worse than no trap at all.

KEEPING WATER LEVELS UP TO THE SAFETY LINE IS AS ESSENTIAL TO A BOILER'S LIFE AS CHECKING HARDENING OF THE ARTERIES IN THE HUMAN SYSTEM IS TO THE LIFE OF MAN.

Send for Bulletin No. 16-HV giving full details.

We solicit your correspondence on heating difficulties.

THERMO SYPHON TRAPS ADD TO THE LIFE OF ANY BOILER

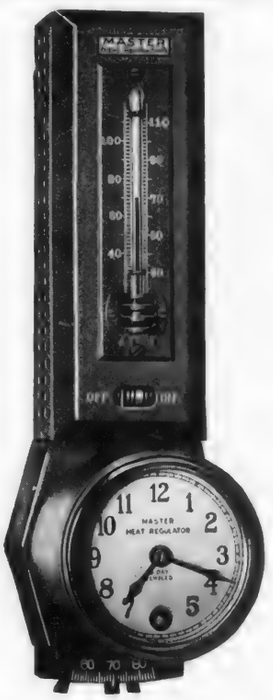
Thermo Syphon Traps may be used with success on the various prominent patented vapor, vacuum, atmospheric and modulation systems. They will put new life in old heating systems.

Thermo Syphon Traps are especially designed to handle condensation from any type of one or two pipe steam heating systems with a vacuum or pressure not exceeding 20 pounds boiler pressure.

THERMO SYPHON

LYTTON MANUFACTURING CORPORATION

FRANKLIN, VIRGINIA



Full Electric Motor of the Master Heat Regulator.

Its Gradual Operation Means Closer Regulation

Much greater uniformity, much closer regulation of the fire—that's the result of the exclusive gradual operation of valves or dampers by the

MASTER HEAT REGULATOR

The **Thermostat** shows the position of the valves or dampers at all times, thus indicating to the user the condition of the fire.

Plain or clock models. Used with coal, gas or oil. For steam, hot water, warm air or combination plants. Write for complete information.

W-M-C Water Thermostats

For hot water heating systems—accurate, dependable, inexpensive. Installed without drawing boiler or stopping fire. **Write for details today!**

White Mfg. Co.

2362 University Ave., St. Paul, Minn.

Viewed from every angle it pays to use Jenkins

To the owner, Jenkins Valves mean long, trouble-free performance . . . the kind of performance that strengthens the contractor's reputation for good workmanship.

To the contractor, the installation of Jenkins means freedom from future servicing of completed jobs. Jenkins help in keeping men on new work.

And to the contractor's men, Jenkins mean easy, quick installation—a result of the uniform, sturdy threads and strong bodies — and the satisfaction of knowing that a job done with Jenkins is always well done.

Made in bronze and iron, in standard, medium and extra-heavy pattern, there's a Jenkins for practically every service. At supply houses everywhere.

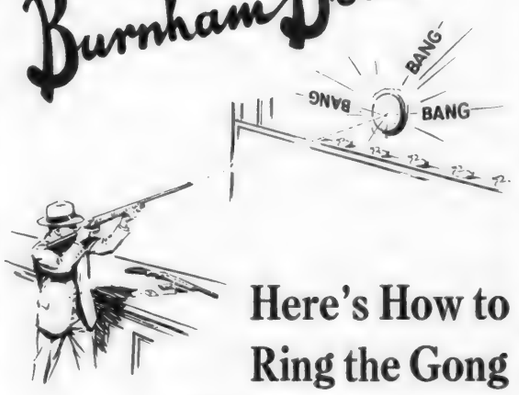
JENKINS BROS.

80 White Street, New York, N.Y. 133 No. Seventh Street, Philadelphia, Pa.
524 Atlantic Avenue, Boston, Mass. 646 Washington Boulevard, Chicago, Ill.
JENKINS BROS., Limited, Montreal, Canada; London, England
Factories. Bridgeport, Conn., Elizabeth, N. J.; Montreal, Canada

Jenkins
VALVES
Since 1864

Knock 'em Down
With

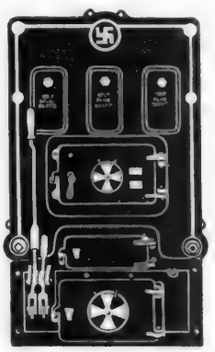
Burnham Boilers



Here's How to Ring the Gong With Every Shot

There are just so many possible boiler sales to be made in any community. To get your share in yours, you must be pretty close to ten hits out of every ten you try for.

Burnham Water Tube Type Boilers. Series 27", will give you a higher percentage of hits in home heating. They have the invariable Burnham feature,—extra long fire travel.



This Water Tube Type Burnham comes also in a swanky Venetian red and black jacket.

Burnham Boiler Corporation
IRVINGTON, NEW YORK
Representatives in all principal Cities of the United States and Canada

IT CAN BE DONE OTHER WAYS

SOME contractors have used plugs—others have gone to the needless expense of putting in blind nipples but these are only clumsy inefficient attempts to solve the problem of venting new water—for steam radiators. The only successful way is the In-Airid way.

The In-Airid shown above was specially designed to vent new water radiators when used on steam. It prevents the short circuiting of steam across the top openings and insures complete venting of all cold air. This valve is the one sure means of avoiding venting troubles on your new one-pipe steam and vacuum jobs.

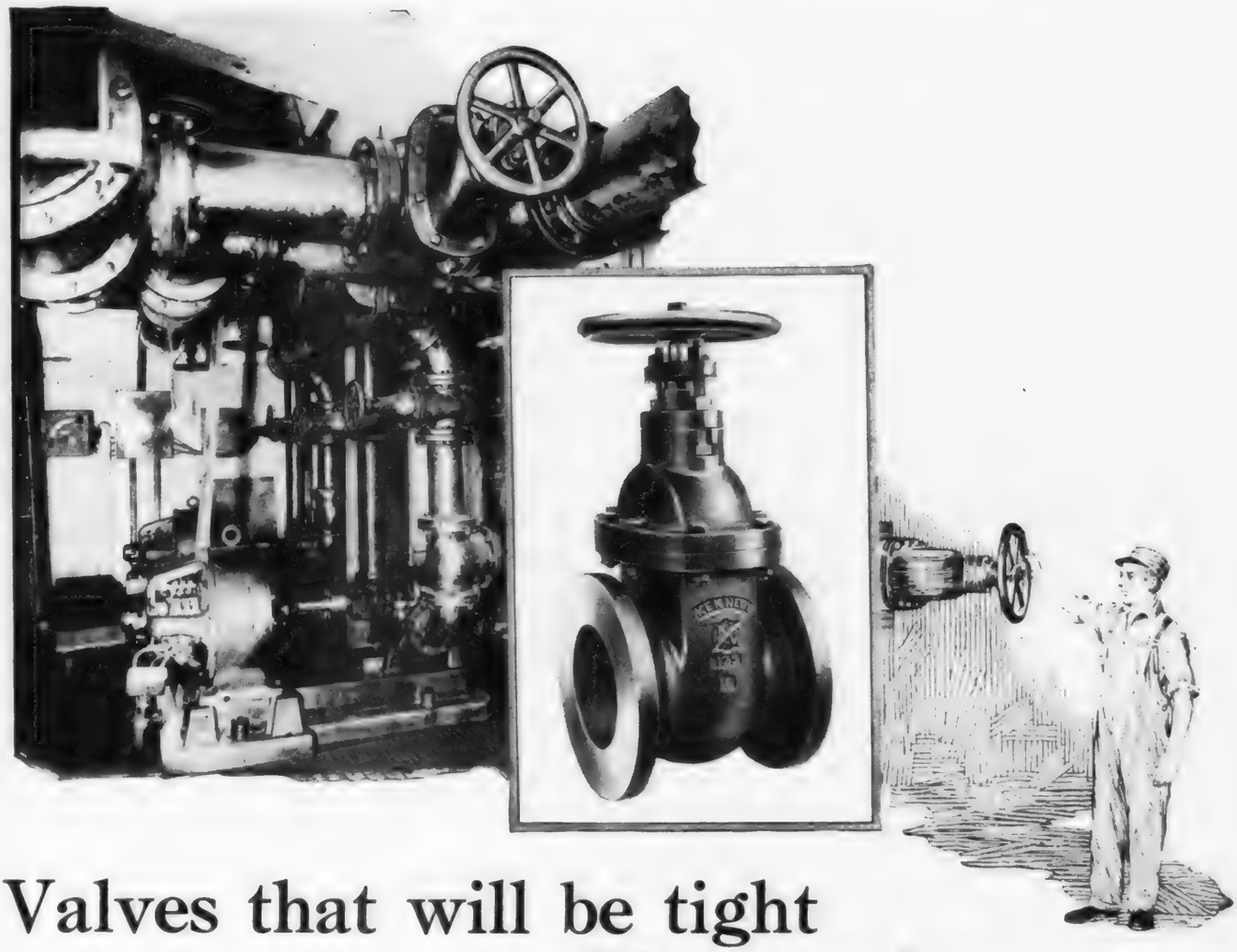
. . .

Thousands of Heating contractors have standardized on In-Airid—There must be a Reason!

IN AIRID
The Invisible AIR VALVE
No. 1 for Steam . . . No. 2 for Vacuum

Airids No. 500 and Vac-Airids No. 510 are still the best valves to use for replacement on old style steam radiation.

AMERICAN RADIATOR COMPANY
Makers of a complete line of VALVES, VENTS, *and* REGULATORS



Valves that will be tight 20 years from now

THE operating records of Kennedy Valves bear striking testimony to their sturdiness and lasting qualities. Kennedy Valves twenty, thirty and even forty years old are in active service all over the country, still in such good condition that they promise many additional years of usefulness.

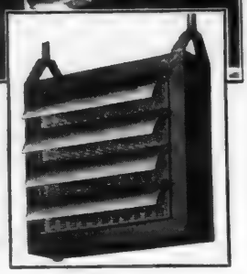
Records such as these are a safe guide for your valve selection. Whether you need high or low pressure valves, of any size, material or method of operation, the big Kennedy line of 6000 types and sizes provides an exactly suitable selection that will give you dependably good service. Send for the Kennedy Catalog describing Kennedy Valves and Fittings in detail and explaining their points of special goodness.

THE KENNEDY VALVE MFG. CO., ELMIRA, N. Y.

Branches in principal cities

KENNEDY

VALVES-PIPE FITTINGS-FIRE HYDRANTS



TRANE SERVICE

to Heating Contractors, Engineers and Architects

In addition to accurate ratings of the 17 types and sizes of Trane Unit Heaters for every steam condition encountered in general heating practice, which facilitate the selection of the most economical units for any given job, our service to contractors, engineers and architects extends also to the checking of heating installations. You will find that from the patented heating element of the Trane Unit Heater to the completed installation of a Trane Unit Heating System, every step represents the resources of one of the finest engineering staffs in the heating field.

When you select Trane Unit Heating, you may ordinarily estimate the original cost of an installation 30 to 40% below that of cast iron or pipe coil radiation. Trane Unit Heaters and Blast Heaters, due to the low air resistance through them, are especially well adapted for use in complete heating and ventilating systems. For full information on Trane Unit Heating send the coupon.

HEAT CABINETS **TRANE** CONCEALED HEATERS

PUMPS, UNIT HEATERS, AND HEATING SPECIALTIES

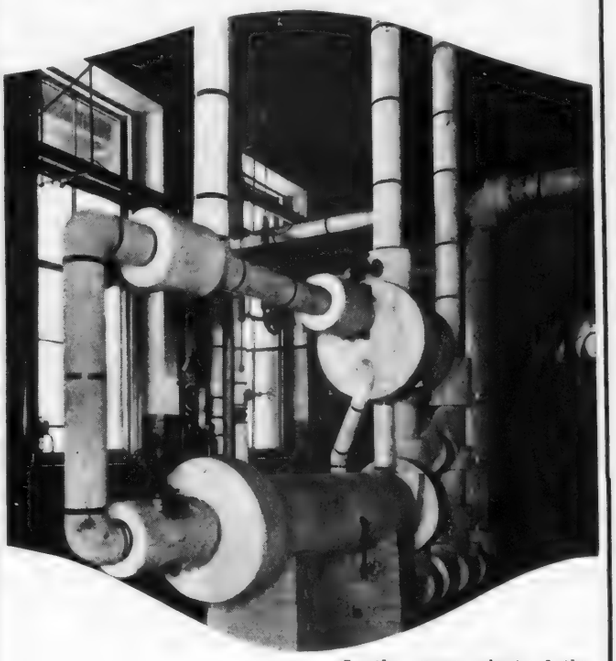
The Trane Company, Dept. 10
206 Cameron Ave., La Crosse, Wis.
Send free booklet on "How to Cut Heating Costs"

Name .....

Address .....

City ..... State .....

Temperature Held to Close Limits



In the power plant of the New England Dressed Meat and Wool Co.—Swift & Co., Boston, Mass., with view of National Heaters.

The two National Instantaneous Heaters shown in this fine installation hold the temperature of the water used for washing beef, etc., to very close limits. The upper heater is of the steam tube type, the lower heater of the water tube type, both connected to a large steel storage tank twenty feet above the engine room floor.

Any type of National heat transfer apparatus will give you the same satisfactory service, being carefully engineered and designed as well as fabricated in a modern plant with all facilities. Let our many years of experience benefit you.

Write us for bulletins and quotations.

NATIONAL

HEAT EXCHANGE APPARATUS

THE NATIONAL PIPE BENDING CO.

Est. 1883

120 River Street, New Haven, Conn., U.S.A.

Boston New York Philadelphia

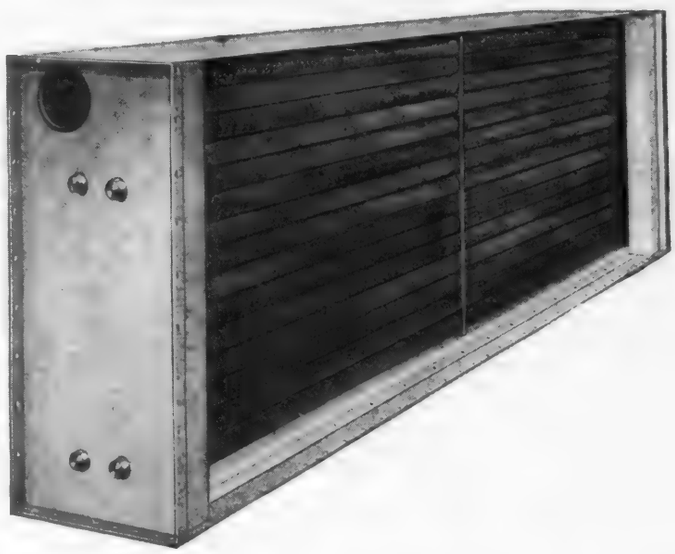
WATKINS GLEN HIGH SCHOOL
Architect—Carl C. Ade—Rochester, N. Y.

WATKINS, N. Y.
Heating Contractor—American Warming & Ventilating Co., Elmira, N. Y.

ARCOBLAST

ENCASED HEATERS

Used for Heating and Ventilating in Auditorium and Gymnasium



HEATING engineers figuring surface for central fan and plenum chamber work will find Arcoblast Encased Heaters offer the following outstanding features.

Galvanized Encasement—Complete and ready for pipe connections.

No soldered steam-backed joints—Tubes expanded in headers—Insured ample strength for high pressure.

Non-corrosive—Heating surface entirely non-ferrous metal.

Assured strength with minimum weight.

Write today for catalog giving complete information and engineering data.

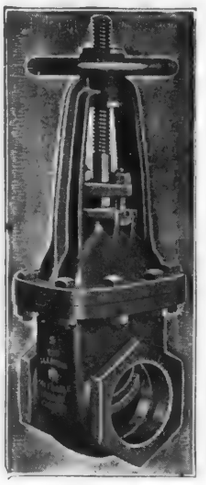
AMERICAN RADIATOR COMPANY

816 South Michigan Avenue, Chicago 40 West 40th Street, New York

IRON BODY GATE VALVES

SCREWED, FLANGED
AND
HUB END STYLES

NON-RISING STEM
AND
O. S. and Y. PATTERNS

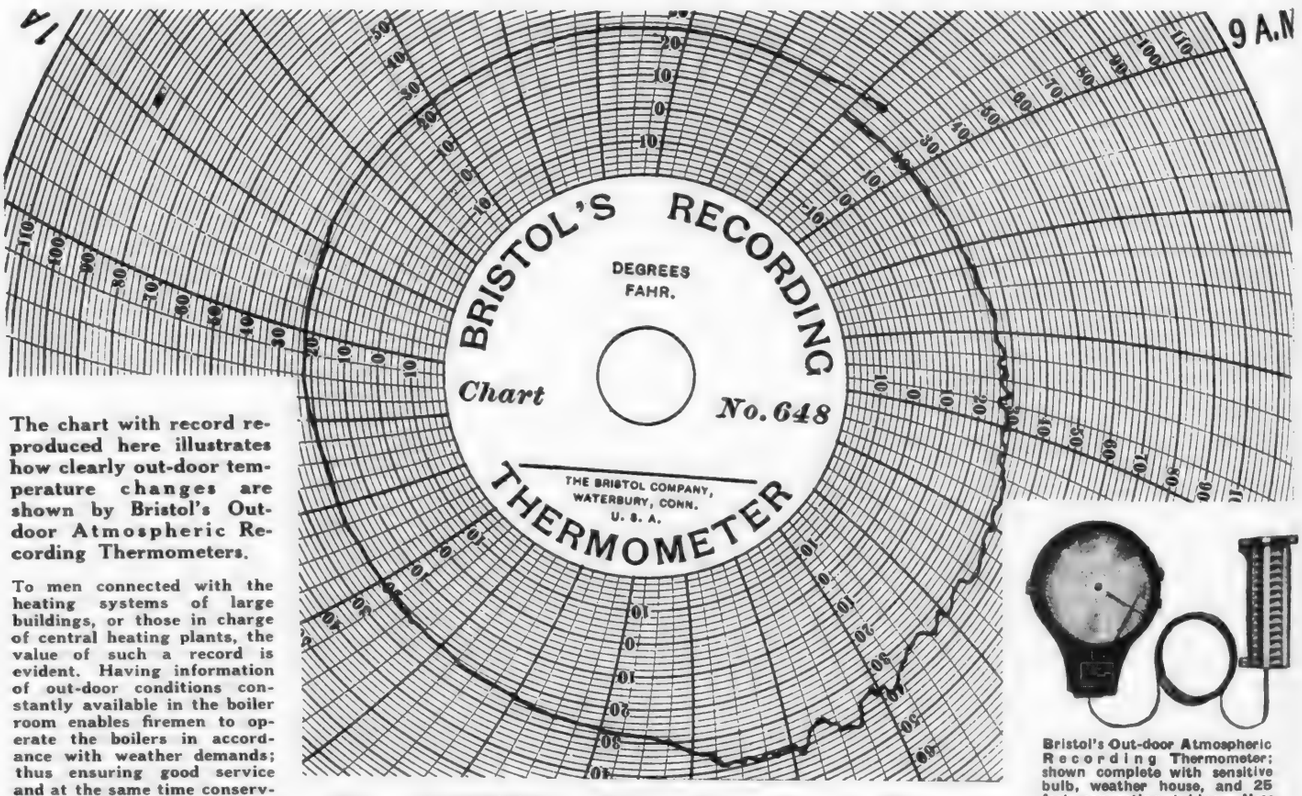


ALSO MANUFACTURERS OF
Cast and Malleable Iron Fittings
Brass Valves and Fittings

Illinois Malleable Iron Company

1801 Diversey Parkway :-: :-: Chicago, Ill.

Keep Up With Out-Door Temperatures

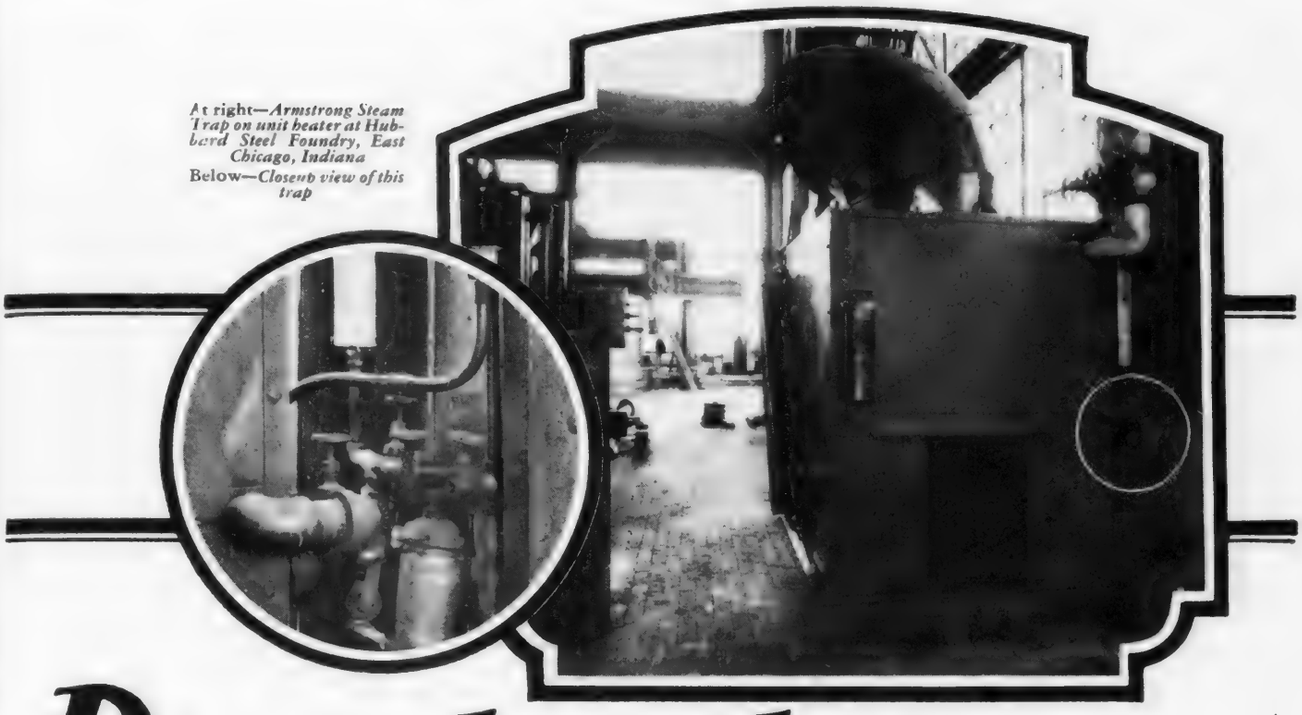


The chart with record reproduced here illustrates how clearly out-door temperature changes are shown by Bristol's Out-door Atmospheric Recording Thermometers.

To men connected with the heating systems of large buildings, or those in charge of central heating plants, the value of such a record is evident. Having information of out-door conditions constantly available in the boiler room enables firemen to operate the boilers in accordance with weather demands; thus ensuring good service and at the same time conserving fuel. Write for complete information, prices, etc.

Bristol's Out-door Atmospheric Recording Thermometer; shown complete with sensitive bulb, weather house, and 25 feet connecting tubing. Uses 12 and 8-inch charts. Rugged, fool-proof construction.

The BRISTOL CO., Waterbury, Conn.



At right—Armstrong Steam Trap on unit heater at Hubbard Steel Foundry, East Chicago, Indiana
Below—*Closeup view of this trap*

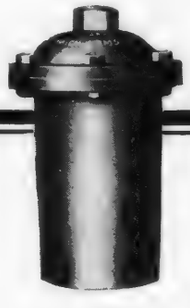
Don't handicap your unit heater

Operating a unit heater without draining off the condensate as fast as it forms is as wasteful as burning coal that's partly slate. The condensate does no heating itself and displaces that much live steam.

The modern way of removing condensate is by the use of Armstrong Traps, which also discharge entrained air and gases. They give uninterrupted, dependable service, irrespective of pressures and temperatures, and are light and compact enough to be supported by the pipes in which they are placed.

We'll gladly cooperate with engineers and architects in determining the proper kind of trap for any type of heating job, without obligation.

Note the small size and simplicity of the Armstrong Trap. No gauge glasses or air relief cocks are required. Crating for shipment is eliminated



ARMSTRONG
MACHINE WORKS
346 Maple Street, Three Rivers, Mich.
District Representatives in 42 Cities

ARMSTRONG "INVERTED BUCKET" STEAM TRAP

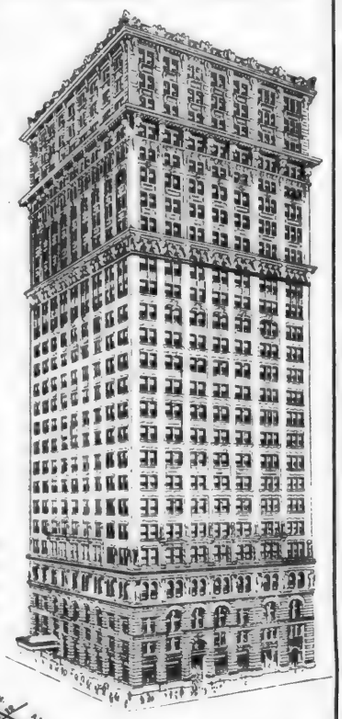
H&V 10-Gray

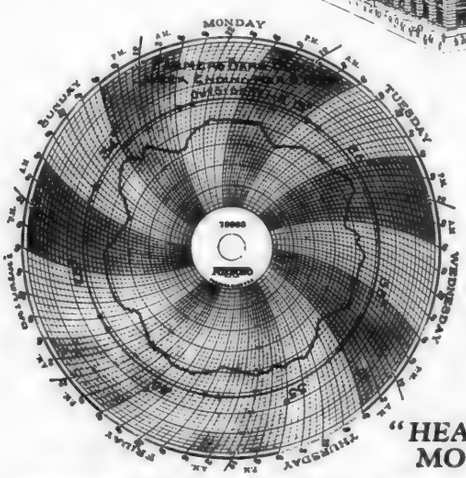
Do you know - - - - - - Farmer's Building, Pittsburgh fully maintains comfort with heat turned off 50% of the time?

And do you know that this remarkable steam heating economy was effected through the use of the Hornung Pressure and Thermostatic System of Master Control? And that observations made and compiled on various other representative installations show equally gratifying results ... not only due to the practically constant day temperature maintained, but also to the great economies effected? *Records show that during the heating season steam is turned off such systems at least 50% of the time!* The Hornung Master Control valve prevents over-heating ... steam is shut off when nobody needs it and fuel consumption is stopped.

The Master Control installed in the 24-story Farmer's Bank Building consists of one ten-inch main reducing valve, two eight-inch, one four-inch, and one two-inch motor-driven thermostatic valves located in the various branches of heating main. *The savings effected in first heating season more than returned the initial investment.*

Chart Below Shows inside temperature for one week with the mean outside temperature noted. At 19 degrees outside temperature, the maximum cooling rate with all heat shut off was nine degrees in six and one-half hours, while on a 34-degree day it was nine degrees in ten hours.





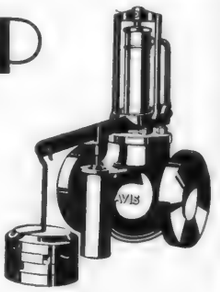
FARMERS BANK BUILDING, *Pittsburgh.*

Full details are given in our special Bulletin sent free on request.

"HEAT LOST IS MONEY LOST"

CENTRAL HEAT APPLIANCES
J. C. HORNUNG—Engineer
343 So. Dearborn Street, Chicago, Ill.

UPKEEP -A MEAN WORD!



The valve you buy today works when first put in the line—but what will the score be at the end of a few years? How much time and material will it need to keep it on the job?

Davis Pressure Regulators are simple and sturdy—correctly designed for a lifetime of dependable action.

They stay on the job—as shown by records in thousands of plants—without the upkeep that makes operating men sweat and accountants sniff.

Send for Catalog No. 11

G. M. DAVIS REGULATOR CO.
436 Milwaukee Avenue • Chicago, Illinois

Balanced Valve • Float Valve • Steam Trap • Back Pressure Valve • Stop and Check Valve • Exhaust Relief Valve • Non-Return Valve • Float Box with Control Valve • Butterfly Valve

DAVIS AUTOMATIC VALVE SPECIALTIES

H&V10-Gray

THE SIGN B&J OF QUALITY

QUALITY HEATING SYSTEMS

Barnes & Jones

128 Brookside Ave.
Jamaica Plain, Boston

101 Park Ave.
New York City

Modulation Vapor and Vacuum Heating Systems of Proven Quality

5 Horse Power Century Type RS
Repulsion Start Induction Single Phase Motor

Brushes Last

The long brush life of Century Single Phase Motors is due to the positive action of Century's perfected brush-lifting mechanism—as proved by more than 25 years of continuous, dependable operation in practically every kind of constant-speed motor application, under all kinds of service conditions, in all parts of the world... This is only a detail—but it is highly significant, because it typifies Century's careful attention to every feature of motor design and construction...Century Motors "Keep a-Running".

Century Single Phase Motors are built in standard sizes 1/8 to 40 horse power. Temperature rating, 40° C.

CENTURY ELECTRIC COMPANY
1806 Pine St. St. Louis, Mo.
40 U. S. and Canadian Stock Points and more than 75 outside thereof

Century MOTORS

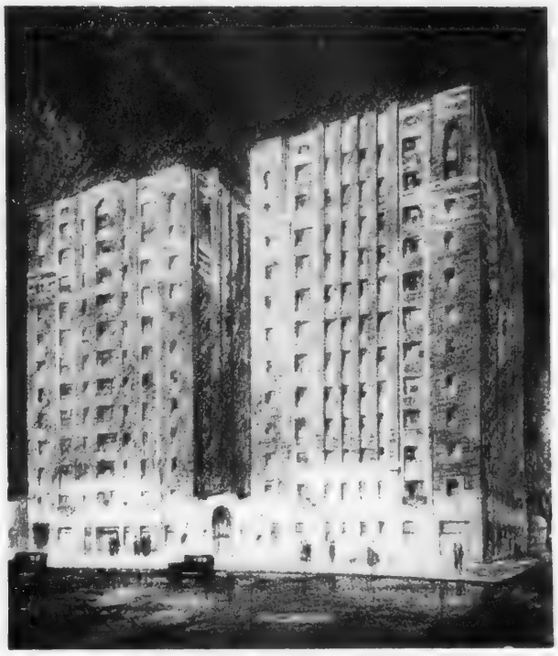
"THEY KEEP A-RUNNING"

Another Achievement

An ultra-modern apartment catering to a critical patronage *must have* ultra-modern equipment throughout. Correct and efficient heating is especially vital. The selection of "COATESVILLE BOILERS" reflects a nation-wide confidence among the architects and heating engineers which is based on their excellent past record.

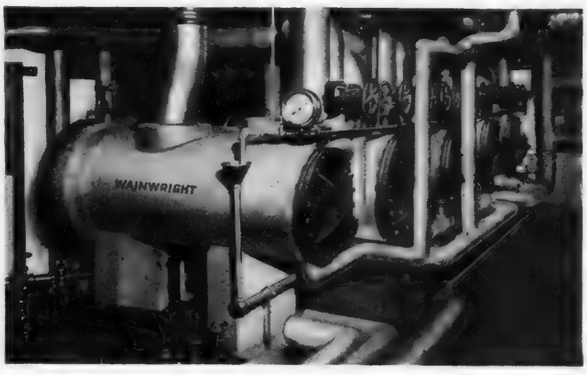
Ralph B. Bencker, Architects
William M. Anderson, Heating Contractor
Frank G. Stewart, General Contractors

COATESVILLE BOILER WORKS
Boilers - Tanks - Steel Plate Work
COATESVILLE, PA.



GARDEN COURT ANNEX
N. E. Cor. 47th and Pine Streets, Philadelphia, Pa.

A Dependable Hot Water Supply



Wainwright heaters that supply hot water in one of the leading New York hotels. Wainwright heaters are available in the vertical or horizontal types.

Wainwright heaters are built for any size project, hotels, apartments and hospitals.

Wainwright hot water heaters are built to meet any capacity requirements or temperature range. Either exhaust or live steam may be used for heating the water.

The Wainwright hot water heaters installed in one of the largest and most modern of New York hotels are shown in the accompanying illustration. Besides supplying the guests, kitchens, etc., the complete hotel laundry is furnished with hot water from these heaters.

The piping and valves are so arranged that the high, intermediate and low pressure heaters are interchangeable. This permits of one heater handling the hot water supply to all floors in cases of emergency.

FOSTER WHEELER CORPORATION
165 Broadway, New York, N. Y.
Branches in Principal Cities

Foreign Associates:—
Foster Wheeler Limited; London, England.
Societe Anonyme Foster Wheeler; Paris, France.
Foster Wheeler Limited; Toronto-Montreal-Vancouver, Canada.

FOSTER WHEELER

KIELEY

SINCE 1879

SPECIAL "98"

FIFTY years ago when Kieley Specialities were first placed on the market they have been constantly building—building a reputation for reliability and economy. Continuous expression of their reputation is evidenced by the fact that in every large project, every monumental building or hospital, Kieley Specialties may be found. Some of the most recent installations are: New York Life Building—Chanin Tower Building—New York Central Station at Buffalo—Hotel New Yorker—The Medical Center, New York City—Royal York Hotel, Canada. The installation of Kieley products in buildings of this character we believe warrants their consideration by Architects and Consulting Engineers who are not already acquainted with their qualifications.

KIELEY & MUELLER, Inc.

34-38 West 13th Street

New York City, N. Y.

A Picture that Helps You *Sell*....

This cross section diagram of the Newport Magazine-feed Boiler has carried to millions of potential buyers the message of modern heating, the cheapest and easiest way.

Savings of $5 to $7 per ton on the low-cost fuels which maintain uniform heating in the Newport have, alone, sold these better boilers in all parts of the country.

Now is the time for you to turn wide-spread Newport acceptance into ready profits for yourself. Make money on more modern heating. Our complete printed Merchandising Plan will help you to get the best business and the sweetest surest profits.

Use the coupon below for convenience

THIS diagram shows the unique magazine-feed principle of the Newport Boiler. You fill the magazine never more than once a day . . . usually two or three times a week, as the weather requires. As the fuel burns away at the bottom gravity feeds more coal from above. An even firebed is maintained.

Successful heating for 15 years. Thousands of satisfactory installations have proven the soundness of Newport magazine feed-heating.

NEWPORT MAGAZINE FEED BOILERS

A size for every need, Bungalows, Homes, Apartments and other Buildings. Steam, Vapor or Hot Water systems.

WRITE TODAY FOR NEWPORT MERCHANDISING PLAN

NEWPORT BOILER COMPANY,
529 S. Franklin St., Chicago

Name.....

Address.....City.....

DISTRIBUTORS IN ALL PRINCIPAL CITIES—U. S. AND CANADA

SATISFIED TENANTS

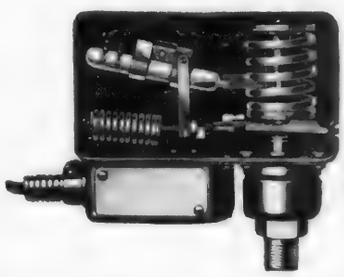
APARTMENT owners are finding the Bryan Boiler a decided asset in keeping tenants satisfied. The reason is obvious—even heat everywhere, all the time. Heating apartment houses with oil is economical, too, when a Bryan Boiler is used.

Apartment houses are becoming more popular all the time and Bryan Boilers are solving the heating problem in many of them.

We suggest that Bryan Dealers pay particular attention to this phase of the heating businesss.

BRYAN
STEAM CORPORATION
BOILER DIVISION
PERU, INDIANA U.S.A.

MERCOID
CONTROLS
for automatic heating

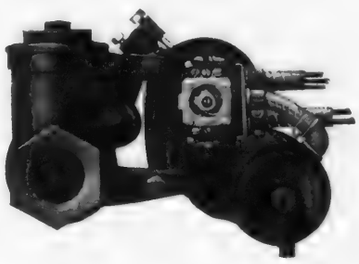


Mercoid Control No. 848

Adopted as standard for boiler control by most manufacturers of Automatic Stokers, Buckwheat and Culm Burners and is widely used on Oil Burners.

The model shown above is only one of a complete line for the control of pressure from vacuum to 2500 lbs. and temperature from minus 30 degrees to 600 degrees F. One model especially designed for vapor control in ounces.

These controls operate on full line current—either 110 or 220 volts. Their construction is rugged and simple—no delicate adjustments. There are no open arcs or corrosion of contacts. They are extremely accurate, dependable and free from troublesome servicing.



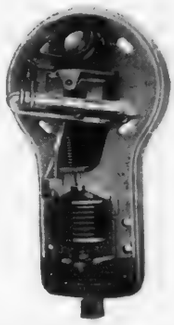
Arco Motor Valve No. 847

Single seated motor driven valve for high or low pressure steam, water, oil, gas, brine, etc.

This motor valve is being widely used in connection with zone heating and also to control steam to those buildings supplied from a central station.

When used in combination with the Mercoid Thermostat, it offers the Heating Engineer an opportunity to be of service to the owners of old installations as well as new.

Where the radiation in larger buildings has been zoned and equipped with these controls, owners report to us a surprising saving in fuel besides a decided increase in the heating comfort of the offices and work rooms. Engineers report that in a year or so the saving in fuel pays for the cost of the equipment.



Mercoid Thermostat No. 845

Room Temperature Type. For temperature control on Oil Burning equipment, Unit Heaters, Stokers, Refrigeration and General Industrial work. Thousands of these Thermostats are now in operation and engineers everywhere are praising their accurate, dependable performance.

The 845 is especially well-fitted for Unit Heater work. Connected with the motor, the Mercoid starts and stops the fan according to changes in temperature, thus preventing over and under-heating and effecting a remarkable saving in steam and current consumption. Also operates on 110 or 220 volts and carries the well-known Mercoid switch—no open arcs or corrosion of contacts.

Every Heating Engineer should know about the complete line of Mercoid Controls. Full information furnished on request without the slightest obligation. Mail the coupon today.

AMERICAN RADIATOR COMPANY

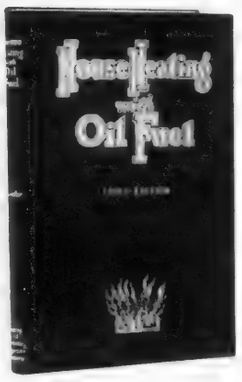
AMERICAN RADIATOR COMPANY
Accessories Division MHV-4
40 WEST 40th STREET, NEW YORK

Please send me without obligation complete information on the Line of MERCOID Controls for Automatic Heating.

*Name*_____

*Address*_____

*City*_____ *State*_____



Have You Read This Book?

Every reader of this magazine should be fully posted on the developments in the use of oil fuel in house heating; whether he is selling equipment for it, or meeting it as competition. There is no better source of information than this unbiased treatment of the entire field by P. E. Fansler, E.E. 150 especially prepared photographs, diagrams, and charts are used to illustrate it. A glance at the Table of Contents given below will show how comprehensive and up to the minute it is.

Contents by Chapters

1. The Era of Automatic Control. 2. The Use of Liquid Fuels For House Heating. 3. Oil Fuels —Definitions, Characteristics & Specifications. 4. Oil Fuels— Source, Preparation and Distribution. 5. Combustion—Theory. 6. Combustion — Practical Considerations. 7. Boilers For Use With Oil Burners. 8. Boilers Particularly Adapted to Oil Burning. 9. Warm Air Furnaces For Use With Oil Burners. 10. Oil Burners — Types — Characteristics. 11. Oil Burners — Atmospheric. 12. Oil Burners — Mechanical Draft. 13. Oil Burners—Mechanical Draft (continued). 14. The Control of Oil Burners. 15. Oil Burner Accessories. 16. Tanks & Storage. 17. Efficiencies. 18. The Iso-Degree Day Chart and the Iso-Oil Consumption Chart. 19. The Value of House Insulation. 20. Selling Oil Burners. 21. How Many Gallons of Oil Equal a Ton of Coal. 22. Checking the Radiation. 23. Checking the Heating Plant Installation. 24. Installing the Oil Burner. 25. The Underwriters' Regulations. 26. Heating Service — Servicing Oil Burners. 27. Buying An Oil Burner. 28. What the Underwriters' Listing Means. 29. Domestic Oil Burners Listed By the Underwriters' Laboratories. 30. Oil Burner Ordinances. 31. Oil Burner Fires. 32. Bibliography.

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The Design of Gravity-Circulation Water Heating Systems, by F. E. Giesecke, Ph.D. A book, remarkable for its conciseness and clearness of expression, which contains the essence of the information needed for the proper design of gravity water heating systems, based on the principle that the frictional resistance must equal the force maintaining flow. The importance of the presentation is evidenced by the fact that the substance of the methods here presented are embodied in the water heating section of the A.S.H. & V.E. Compendium of Modern Practice. 64 pages of text and 10 pages of tables and charts. Price $3.00.

Heating and Ventilation, by the late John R Allen and J. H. Walker. This is the second edition of this work and has been brought up to date in every particular, including the latest radiator transmission factors put out by the Research Laboratory of the A.S.H. & V.E. and the Hill synthetic air chart testing method. Especially adapted for use as a text book. 322 pages, 6 x 9 inches. Cloth, $3.50.

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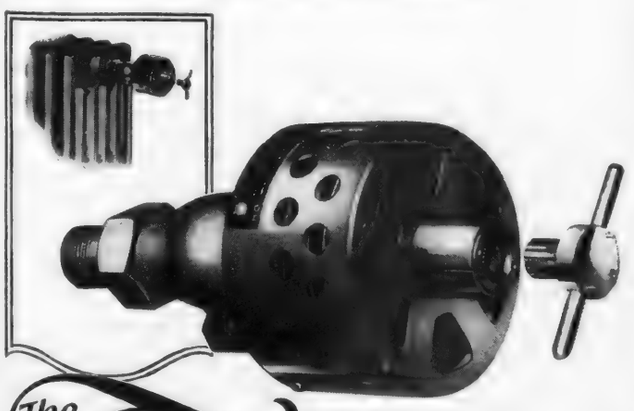

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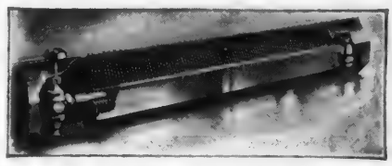

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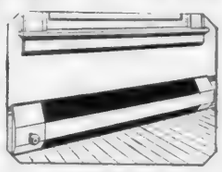

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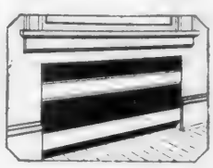

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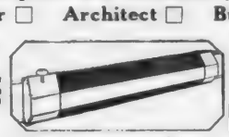
"RICHMOND" FLOORLINE  RADIATOR

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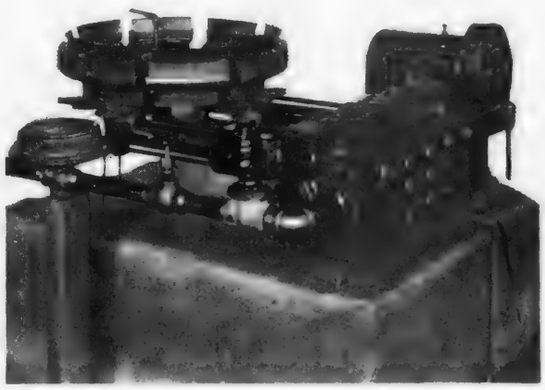

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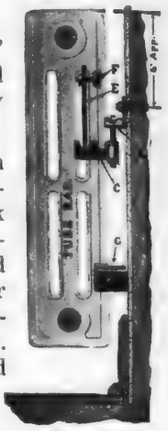

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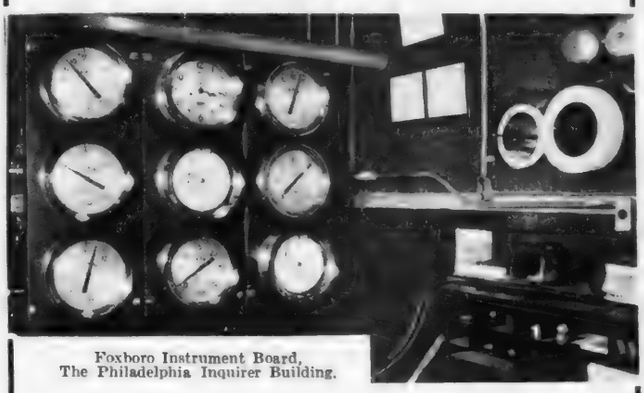

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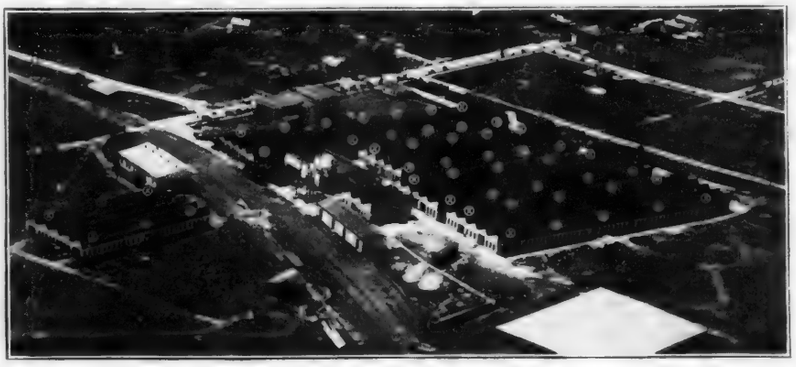

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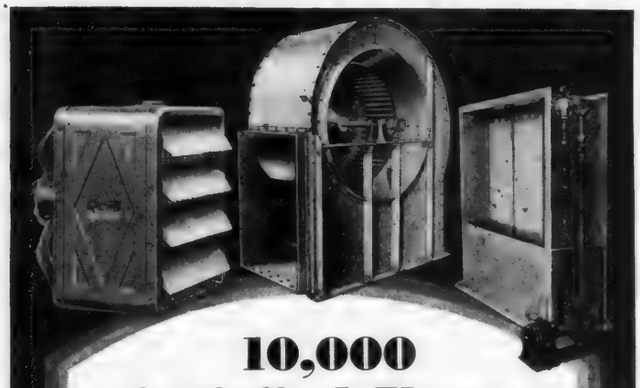

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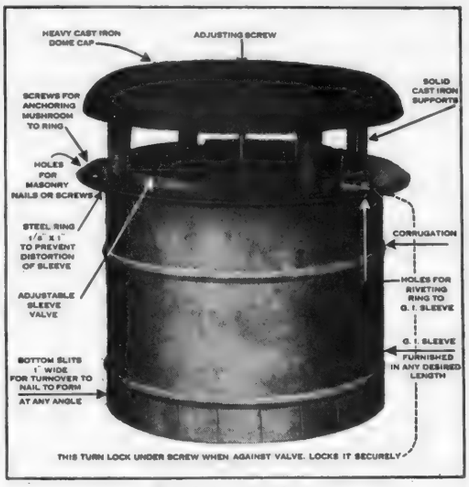
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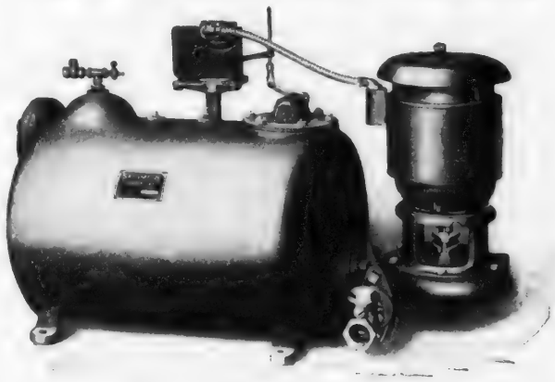

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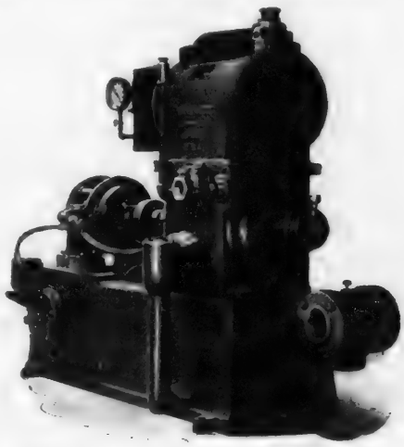

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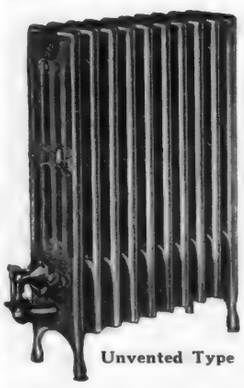

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There is no heating apparatus on the market today that equals the Automatic Gas Steam Radiator in convenience and comfort. They afford steam heat, which is universally known as the best means of heating. They are automatically controlled. There is no boiler, no dirt, no labor, and heat when and where you want it by simply striking a match.

The flue type Automatic Gas Steam Radiator is intended to aid in ventilating by taking air from the floor through the radiator into a chimney or flue outlet. This is in a manner forced ventilation.

AUTOMATIC GAS STEAM RADIATOR CO.
301 BRUSHTON AVENUE, PITTSBURGH, PENNSYLVANIA

Vented Type

Corrosive

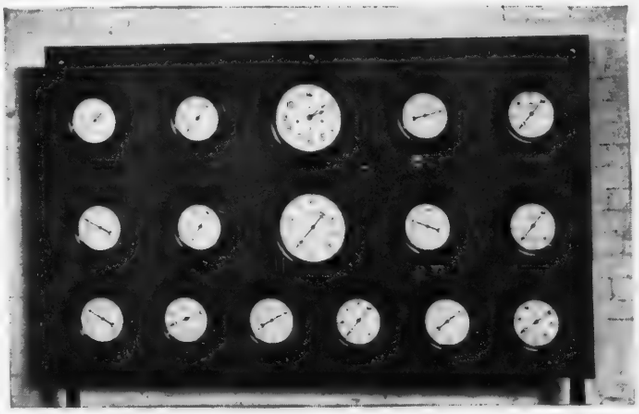
fumes are destructive to ordinary materials.

coatings and linings on the exposed surfaces of fans handling such fumes give only temporary protection and require eternal vigilance.

Duriron exhaust fans, efficient, acid, alkali and rust proof, provide the permanent solution wherever acid fumes must be exhausted.

A new bulletin, No. 158, is now ready. Write for it.

The Duriron Company, Dayton, Ohio



Do You Have Control Like This?

HERE all important temperatures and pressures and the time are together on one gauge board—gas fuel pressure in ounces, oil fuel pressure, atmospheric temperature, high and low pressure steam, feed water temperature and pressure, condensate temperature, brine temperature and pressure, etc. A glance at the board shows all factors affecting operation. This instrument panel is in the boiler room of the Jefferson Davis Hospital, Houston, Texas. Do you have control like this? American Dial Thermometers with American Quality Gauges do the trick.

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Any problem involving, indicating or controlling or recording of temperatures or pressures or speeds is our specialty. Individual catalog sections cover different types of instruments. Send for the catalogs you want.

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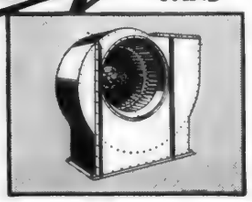
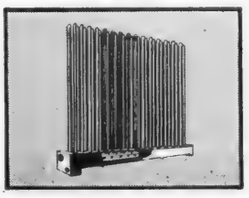
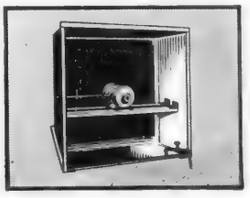
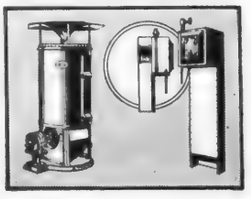
FANS 
HEATERS 
AIR WASHERS 
UNIT HEATERS 

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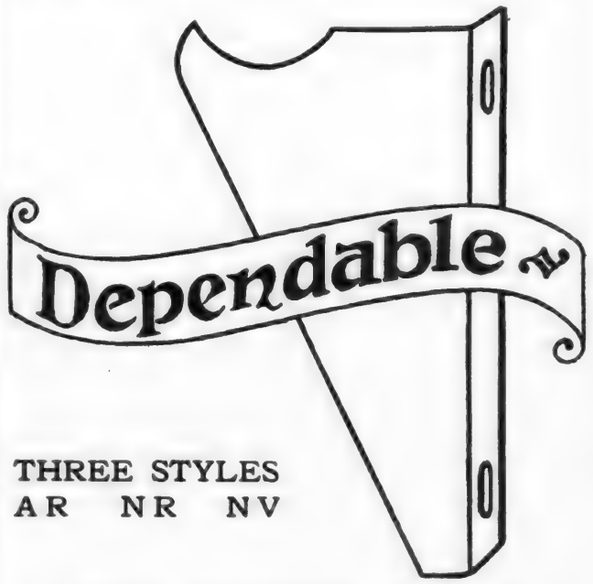

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By specifying the indirect water heater installed *below the water line* of the boiler, architects and engineers can assure their clients of complete hot water satisfaction.

Whether the building be large or small, there is a type of Paracoil Indirect water heater which will exactly fill the requirements.

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Paracoil Water Heaters are rigidly guaranteed both as to construction and service. Their dependable performance and years of usefulness have led to their being specified on many of the largest and most important building jobs.

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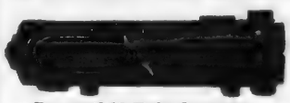

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HEATS YOUR BUILDING WITHOUT COST
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We are very pleased with the filter and pump as well as the service you have given us. We highly recommend your apparatus to anyone.

Very truly yours,

NUGENT TRADE MARK

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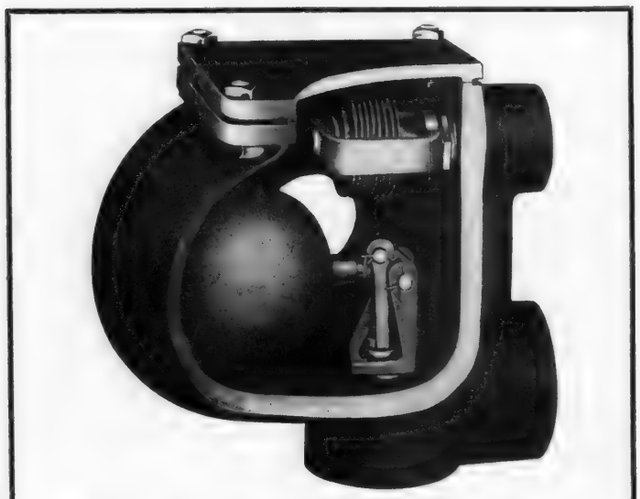

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Especially designed for dripping large supply mains, hot water heaters, unit heaters, etc. A small combination float and thermostatic trap. Self-supporting in the pipe line. Small, compact, and very efficient in operation. Low in cost, high in quality.

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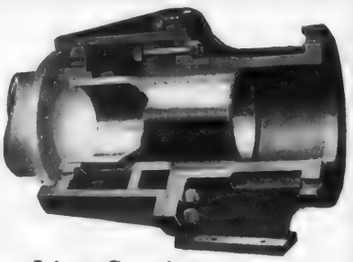

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Stores, banks, theatres, hotels and other public buildings can reduce annual cleaning bills from $500.00 to $3,000.00, or more, depending on the size of building, by installing Protectomotor Panel Air Filters. In addition, huge sums can be saved for repainting and replacing furnishings ruined by dust and soot.

The Protectomotor Panel Air Filter delivers air that is 99-9/10% clean. Dangerous disease germs are also removed from the air by the

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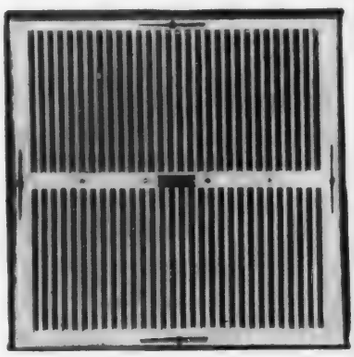
Perfect Positive Protection

PANEL AIR FILTER



The initial cost of the Protectomotor is small, as it requires no oil drains or cleaning tanks. It operates from 2 to 6 months without cleaning and then requires only half a minute per panel to remove dust and dirt with our special vacuum cleaner.

This filter maintains the resistance below any specific static pressure drop.

The Protectomotor is the simplest air filter on the market. It consists of a fine texture felt filter medium formed in pockets over radial rust-proof wire screen fins, mounted in rugged metal frames.

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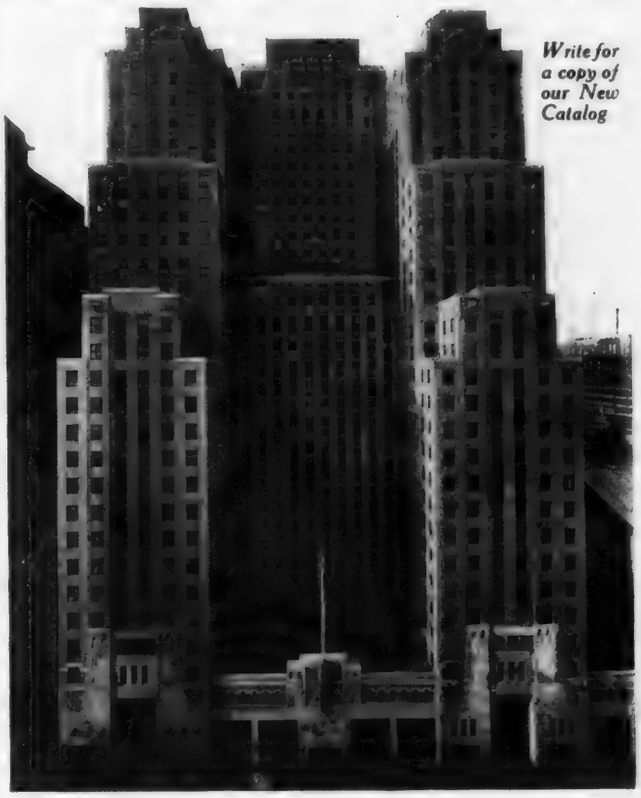

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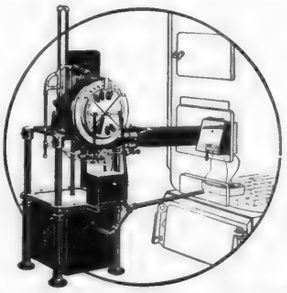

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Mechanical Draft

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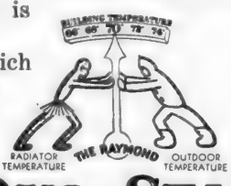

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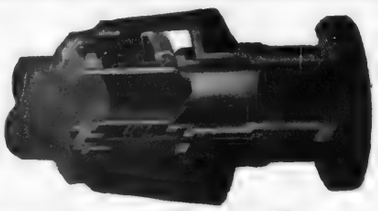

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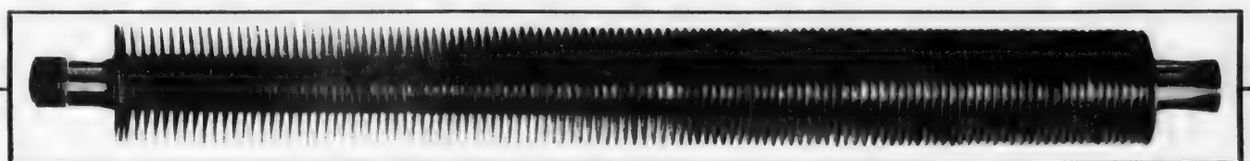

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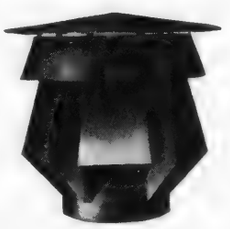

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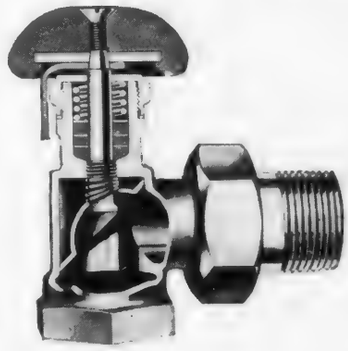

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THIS claim is made because the 901 is the first and only hot water valve to combine these three vital features all in one valve—at practically no extra cost.

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SWINGING PLATE—So designed that it acts as a cleaning tool — Impossible for the valve to stick.

EQUALIZING FEATURE—Adjustable stop with indicator makes it possible to balance the job after installation and then set permanently, maintaining a perfect equalization of flow regardless of pipe size.

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Makers of a complete line of VALVES, VENTS *and* REGULATORS

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Hoffman Specialty Co., New York.
Marsh & Co., Jas. P., Chicago, Ill.
Sarco Co., Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

AIR FILTERS
Air Filtration Co., New York.
American Blower Co., Detroit, Mich.
National Air Filter Co., Chicago, Ill.
Reed Air Filter Co., Louisville, Ky.
Staynew Filter Corp., Rochester, N. Y.

AIR SEPARATORS
Bishop & Babcock Sales Co., Cleveland, Ohio.
Swartwout Co., Cleveland, Ohio.

AIR WASHERS
American Blower Co., Detroit, Mich.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Connor Co., Inc., The W. B., New York.
New York Blower Co., Chicago, Ill.

BELTING
Alexander Bros., Inc., Philadelphia, Pa.

BLOWERS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
De Bothezat Impeller Co., New York,
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

BOILERS, COPPER
Badger & Sons Co., E. B., Boston, Mass.

BLOWERS, FAN
(See Fans, Supply & Exhaust).

BOILERS, HEATING, CAST-IRON, COAL BURNING
American Radiator Co., New York.
Burnham Boiler Corp., Irvington, N. Y.
Illinois Malleable Iron Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Newport Boiler Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Co., New York.
Richmond Radiator Co., New York.
Weil-McLain Co., Chicago, Ill.

BOILERS, HEATING, DOWN-DRAFT, COAL BURNING
American Radiator Co., Buffalo, N. Y.
Brownell Co., The, Dayton, Ohio.
International Boiler Works, East Stroudsburg, Pa.
Kewanee Boiler Corp., Kewanee, Ill.
National Radiator Corp., Johnstown, Pa.
Orr & Sembower Co., Reading, Pa.
Pacific Steel Boilers Corp., Waukegan, Ill.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Co., New York.
Stanwood Corporation, Cincinnati, O.
Titusville Iron Wks. Co., Titusville, Pa.

BOILERS, HEATING, GAS-FIRED
American Gas Products Corp., New York
American Radiator Co., Buffalo, N. Y.
B-Line Boiler Co., Cleveland, Ohio.
International Boiler Works, E. Stroudsburg, Pa.
Frost Mfg. Co., Galesburg, Ill.
National Radiator Corp., Johnstown, Pa.
Orr & Sembower Co., Reading, Pa.
Stanwood Corporation, Cincinnati, O.
Triple Duty Boiler Co., Detroit, Mich.

BOILERS, HEATING, MAGAZINE FEED
Gorton Heating Corporation, New York.
Newport Boiler Co., Chicago, Ill.
Orr & Sembower Co., Reading, Pa.

BOILERS, HEATING, OIL-FIRED
Bryan Steam Corp., Pern, Ind.
Combination Boiler Co., Benton Harbor, Mich.
International Boiler Works, E. Stroudsburg, Pa.
Johnston Bros., Inc., Ferrysburg, Mich.
Monitor Boiler Co., Philadelphia, Pa.
Triple Duty Boiler Co., Detroit, Mich.

BOILERS, HEATING, STEEL, COAL-FIRED
Brownell Co., The, Dayton, Ohio.
Coatesville Boiler Works, Coatesville, Pa.
Fitzgibbons Boiler Co., Inc., New York.
Frost Mfg. Co., Galesburg, Ill.
Gorton Heating Corp., New York.
International Boiler Works, East Stroudsburg, Pa.
Heggie-Simplex Boiler Co., Joilet, Ill.
Johnston Bros., Inc., Ferrysburg, Mich.
Kewanee Boiler Corp., Kewanee, Ill.
Monitor Boiler Co., Philadelphia, Pa.
Oil City Boiler Wks., Oil City, Pa.
Pacific Steel Boilers Corp., Waukegan, Ill.
Pierce, Butler & Pierce Mfg. Co., New York.
Stanwood Corporation, Cincinnati, O.
Triple Duty Boiler Co., Detroit, Mich.

BOILERS, POWER
Fitzgibbons Boiler Co., Inc., New York.
Frost Mfg. Co., Galesburg, Ill.
Stanwood Corporation, Cincinnati, O.
Titusville Iron Wks. Co., Titusville, Pa.

CALORIMETERS
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.

CIRCULATORS, WATER
Janette Mfg. Co., Chicago, Ill.

COILS, PIPE
Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Crane Co., Chicago, Ill.
Foster Wheeler Corp., New York.
National Pipe Bending Co., New Haven, Conn.
Walworth Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

CONDENSERS
Davis Engineering Corp., New York.
Foster Wheeler Corp., New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

CONDUITS, UNDERGROUND PIPE
American District Steam Co., North Tonawanda, N. Y.
Ric-wiL Co., The, Cleveland, Ohio.

CONVERTERS, HOT WATER
Davis Engineering Corp., New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.

COOLERS, AIR
Alberger Heater Co., Buffalo, N. Y.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.

COOLERS, OIL
Davis Engineering Corp., New York.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

COOLING TOWERS & PONDS
Badger & Sons Co., E. B., Boston, Mass.
Buffalo Forge Co., Buffalo, N. Y.
Foster Wheeler Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.

COVERING, BOILER, PIPE, ETC.
American District Steam Co., North Tonawanda, N. Y.
Crane Co., Chicago, Ill.
Ric-wiL Co., The, Cleveland, Ohio.

DAMPER REGULATORS
(See Regulators, Damper).

DAMPERS, DUCT
National Regulator Co., Chicago, Ill.

DEHUMIDIFYING APPARATUS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Johnson Service Co., Milwaukee, Wis.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.
York Heating & Ventilating Corp., Philadelphia, Pa.

DISTILLERS (WATER)
Badger & Sons Co., E. B., Boston, Mass.
Davis Engineering Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.

DRAFT APPLIANCES, MECHANICAL
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
De Bothezat Impeller Co., New York.
National Regulator Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

DRYING SYSTEMS
(See Air Cooling & Drying Systems).

DUST COLLECTING SYSTEMS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Reed Air Filter Co., Louisville, Ky.
Skinner Bros. Mfg. Co., St. Louis, Mo.
St. Louis Blow Pipe & Heater Co., Inc., St. Louis, Mo.

DUST COLLECTORS
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Connor Co., Inc., The W. B., New York.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
York Heating & Ventilating Corp., Philadelphia, Pa.

ENGINES, STEAM
American Blower Co., Detroit, Mich.
Brownell Co., The, Dayton, Ohio.
Frost Mfg. Co., Galesburg, Ill.
Stanwood Corp., Cincinnati, O.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

EQUALIZING LOOPS
Hoffman Specialty Co., New York.
Sarco Co., Inc., New York.

EVAPORATORS, BOILER FEED MAKE-UP
Buffalo Forge Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Foster Wheeler Corp., New York.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.

EXHAUST HEADS
Aeolus Dickinson, Chicago, Ill.
Crane Co., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Swartwout Co., Cleveland, Ohio.

EXHAUST SYSTEMS
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Skinner Bros. Mfg. Co., St. Louis, Mo.
St. Louis Blow Pipe & Heater Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

EXHAUST SYSTEMS, ACID
Duriron Co., Inc., The, Dayton, O.

EXPANSION JOINTS
Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., North Tonawanda, N. Y.
Badger & Sons Co., E. B., Boston, Mass.
Central Station Steam Co., Detroit, Mich.
Crane Co., Chicago, Ill.
Foster Wheeler Corp., New York.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Walworth Co., New York.
Webster & Co., Warren, Camden, N. J.

FANS, CENTRIFUGAL
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

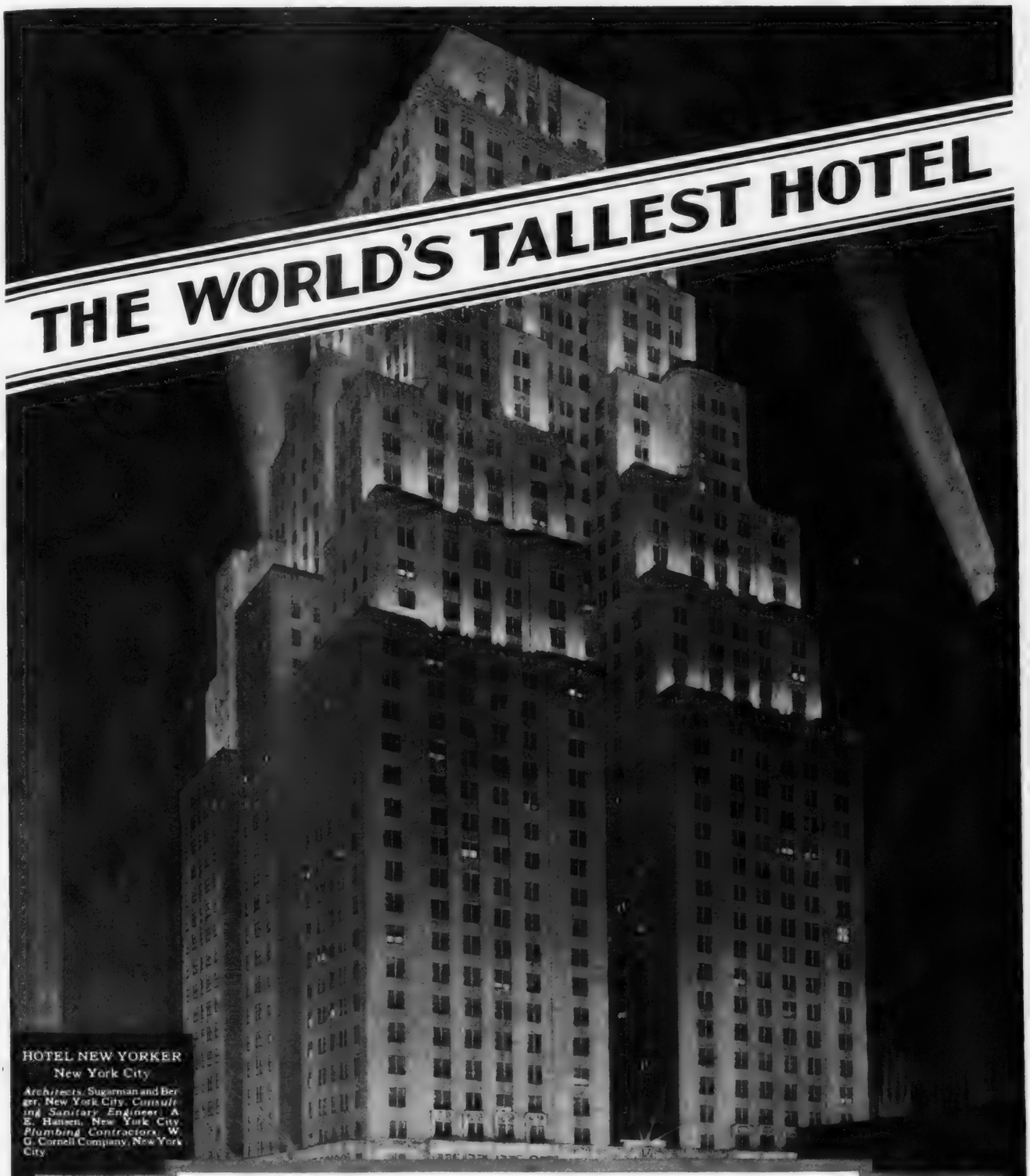
FANS, DISC
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
De Bothezat Impeller Co., New York.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

PRESSURE
De Bothezat Impeller Co., New York.

FANS, PROPELLER
Airmaster Corp., Chicago, Ill.
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
De Bothezat Impeller Co., New York.
Emerson Electric Mfg. Co., St. Louis, Mo.
Hartzell Propeller Co., Piqua, Ohio.
Modine Mfg. Co., Racine, Wis.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.
Young Radiator Co., Racine, Wis.

FANS, MULTI-BLADE
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

FANS, STEEL PLATE
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.



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De Bothezat Impeller Co., New York.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

FEEDERS, BOILER

Cashin Co., W. D., Boston, Mass.
Crane Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.
Walworth Co., New York.
Watts Regulator Co., Lawrence, Mass.

FILTERS, CRANKCASE, OIL

Nugent & Co., W. W., Chicago, Ill.

FILTERS, (AERATING)

Davis Engineering Corp., New York.

FILTERS, FEED-WATER

Davis Engineering Corp., New York.

FITTINGS, ACID RESISTING

Crane Co., Chicago, Ill.
Duriron Co., Inc., The, Dayton, O.

FITTINGS, COMPRESSION PIPE

Nugent & Co., W. W., Chicago, Ill.

FITTINGS, PIPE, FLANGED

Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Walworth Co., New York.

FITTINGS, PIPE, SCREWED

Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Walworth Co., New York.

FLANGES

Crane Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Walworth Co., New York.

GAS BURNERS (CONVERSION TYPE)

Cleveland Gas Burner & Appliance Co., Cleveland, Ohio.
Columbia Burner Co., Toledo, Ohio.
Sweet & Doyle Co., Troy, New York.

GASKETS, ASBESTOS

Crane Co., Chicago, Ill.
Jenkins Bros., New York.

GASKETS, METALLIC

Crane Co., Chicago, Ill.
Jenkins Bros., New York.

GASKETS, RUBBER

Crane Co., Chicago, Ill.
Jenkins Bros., New York.

GAUGE BOARDS

American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

GAUGE GLASSES

American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Crane Co., Chicago, Ill.
Jenkins Bros., New York.

GAUGES, ALTITUDE

American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
National Radiator Corp., Johnstown, Pa.

GAUGES, DRAFT

American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro, Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

GAUGES, HYDRAULIC

American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.

GAUGES, OUNCE GRADUATED

American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol, Co., The, Waterbury, Conn.
Dunham Co., C. A., Chicago, Ill.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

GAUGES, PRESSURE

American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

GAUGES, TANK

King-Seeley Corp., Ann Arbor, Mich.

GAUGES, VACUUM

American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

GAUGES, VACUUM (COMPOUND)

American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

GAUGES, WATER

American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Crane Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York.

GENERATOR COOLING SYSTEMS

American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Reed Air Filter Co., Louisville, Ky.
Schutte & Koerting Co., Philadelphia, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

GOVERNORS (PUMP)

Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland Ohio.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Marsh & Co., Jas. P., Chicago, Ill.
Watts Regulator Co., Lawrence, Mass.
Webster & Co., Warren, Camden, N. J.

GRATES, DUMPING

Fitzgibbons Boiler Co., Inc., New York.
Kewanee Boiler Corp., Kewanee, Ill.
Stanwood Corp., Cincinnati, Ohio.

GRATES, ROCKING

Kewanee Boiler Corp., Kewanee, Ill.
Page Boiler Co., Wm. H., New York.
Stanwood Corp., Cincinnati, Ohio.

GRATES, SHAKING

Fitzgibbons Boiler Co., Inc., New York.
Kewanee Boiler Corp., Kewanee, Ill.
Page Boiler Co., Wm. H., New York.
Stanwood Corp., Cincinnati, Ohio.

GRATES, SHAKING AND DUMPING

Frost Mfg. Co., Galesburg, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Stanwood Corp., Cincinnati, Ohio.

GRATES, SHAKING, CIRCULAR

Fitzgibbons Boiler Co., Inc., New York.

GRATES, STATIONARY

Fitzgibbons Boiler Co., Inc., New York.
Frost Mfg. Co., Galesburg, Ill.
Stanwood Corp., Cincinnati, Ohio.

HEAT CABINETS

(See Radiators, Cabinet and Concealed)

HEATERS, AIR, FAN SYSTEM

Aerofin Corp., Newark, N. J.
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Dwyer Equipment Co., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
National Air Filter Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Rome-Turney Radiator Co., Rome, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Thermal Units Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Wing Mfg. Co., L. J., New York.
Young Radiator Co., Racine, Wis.

HEATERS, DOMESTIC WATER

Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Crane Co., Chicago, Ill.
Davis Engineering Corp., New York.
Foster Wheeler Corp., New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Illinois Malleable Iron Co., Chicago, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Modine Mfg. Co., Racine, Wis.
Monitor Boiler Co., Philadelphia, Pa.
National Pipe Bending Co., New Haven, Conn.
Page Boiler Co., Wm. H., New York.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Weil-McLain Co., Chicago, Ill.
Whitlock Coil Pipe Co., Hartford, Conn

HEATERS, ELECTRICAL UNIT

American Blower Co., Detroit, Mich.

HEATERS, FEED WATER, (CLOSED)

Alberger Heater Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Foster Wheeler Corp., New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Frost Mfg. Co., Galesburg, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Stanwood Corp., Cincinnati, Ohio.
Watts Regulator Co., Lawrence, Mass.
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, FEED WATER (OPEN)

Frost Mfg. Co., Galesburg, Ill.
National Pipe Bending Co., New Haven, Conn.
Stanwood Corp., Cincinnati, Ohio.
Webster & Co., Warren, Camden, N. J.

HEATERS, FUEL-OIL

Alberger Heater Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Electrol, Inc., St. Louis, Mo.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
National Air Filter Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, UNIT

Air-Way Electric Appliance Corp., Toledo, Ohio.
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
De Bothezat Impeller Co., New York.
Dwyer Equipment Co., Chicago, Ill.
McQuay Radiator Corp., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
Nelson Corp., Herman, The, Moline, Ill.
New York Blower Co., Chicago, Ill.
Peerless Unit Ventilation Co., Inc., Bridgeport, Conn.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Thermal Units Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Wing Mfg. Co., L. J., New York.
York Heating & Ventilating Corp., Philadelphia, Pa.
Young Radiator Co., Racine, Wis.

HEATERS, UNIT GAS FIRED

General Gas Light Co., Kalamazoo, Mich.
Texo Sales Co., Cincinnati, Ohio.

HEATING SYSTEMS, VACUUM

Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago Ill.
McAlear Mfg. Co., Chicago, Ill
Marsh & Co., Jas. P., Chicago, Ill.
Sarco Co., Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

HEATING SYSTEMS, VAPOR

American District Steam Co., North Tonawanda, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Gorton Heating Corporation, New York.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Webster & Co., Warren, Camden, N. J.

HEATING SYSTEMS, WATER

American Radiator Co., Buffalo, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Grinnell Co., Providence, R. I.
Hornung, J. C., Chicago, Ill.
Mueller Co., Decatur, Ill.
Page Boiler Co., Wm., H., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.

HUMIDIFIERS

American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Grinnell Co., Providence, R. I.
Johnson Service Co., Milwaukee, Wis.
National Air Filter Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Watts Regulator Co., Lawrence, Mass.
York Heating & Ventilating Corp., Philadelphia, Pa.

HUMIDITY CONTROL

American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Carrier Engineering Corp., Newark, N. J.
Foxboro Co., Inc., The, Foxboro, Mass.
Grinnell Co., Providence, R. I.
Johnson Service Co., Milwaukee, Wis.
National Air Filter Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.

INSTRUMENTS, ELECTRIC MEASURING

Bristol Co., The, Waterbury, Conn.

INSTRUMENTS, INDICATING AND RECORDING

American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.

INSULATION, BOILER, PIPE, ETC.

(See Covering, Boiler, Pipe, etc.)

INSULATION, BUILDING

Celotex Co., Chicago, Ill.
Flax-li-num Insulating Co., St. Paul, Minn.
Insulite Co., Minneapolis, Minn.

KETTLES, COPPER

Badger & Sons Co., E. B., Boston, Mass.

MANOMETERS

American Blower Co., Detroit, Mich.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Foxboro Co., Inc., The, Foxboro, Mass.

LINCOLN BUILDING

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MECHANICAL DRAFT APPLIANCES
(See Draft Appliances, Mechanical)

METALS, THERMOSTATIC
Chace Valve Co., W. M., Detroit, Mich.

METERS, CONDENSATION
American District Steam Co., North Tonawanda, N. Y.
Central Station Steam Co., Detroit, Mich.

METERS, FEED WATER
Central Station Steam Co., Detroit, Mich.
Webster & Co., Warren, Camden, N. J.

METERS, FLOW
Foxboro Co., Inc., The, Foxboro, Mass.

METERS, PITOT TUBE
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.

METERS, STEAM
American District Steam Co., North Tonawanda, N. Y.

MOTORS (ELECTRIC)
Baldor Electric Co., St. Louis, Mo.
Century Electric Co., St. Louis, Mo.
Crocker-Wheeler Electric Mfg. Co.
Emerson Electric Mfg. Co., St. Louis, Mo.
Janette Mfg. Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

NOZZLES, ACID RESISTING
Duriron Co., Inc., The, Dayton, O.

NOZZLES, SPRAY
American Blower Co., Detroit, Mich.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Dunham Co., C. A., Chicago, Ill.
General Air Filters Corp., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

OIL BURNERS
Electrol Inc., St. Louis, Mo.
Hardinge Bros., Inc., Chicago, Ill.
Johnson Co., S. T., Oakland, Cal.
May Oil Burner Co., Baltimore, Md.
McIlvaine Burner Corp., Chicago, Ill.
Nu Way Corp., Rock Island, Ill.
Preferred Oil Burners, Inc., Peoria, Ill.
Winslow Boiler & Eng. Co., Chicago, Ill.

OIL BURNER EQUIPMENT
American Steam Pump Co., Battle Creek, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Hornung, J. C., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
Johnston Brothers, Inc., Ferrysburg, Mich.
Schutte & Koerting Co., Philadelphia, Pa.

OIL BURNER IGNITION AND CONTROL EQUIPMENT
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Penn Electric Switch Co., Des Moines, Iowa.
Temperature Control Co., Chicago, Ill.
Time-O-Stat Controls Co., Elkhart, Ind.
White Mfg. Co., St. Paul, Minn.

OZONE APPARATUS
United States Ozone Co. of America, Scottdale, Pa.

PIPE, ACID-RESISTING
Duriron Co., Inc., The, Dayton, O.

PIPE BENDING
Badger & Sons Co., E. B., Boston, Mass.
Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
National Pipe Bending Co., New Haven, Conn.
Walworth Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

PIPE CASING (WOOD)
American District Steam Co., North Tonawanda, N. Y.

PIPE, CAST-IRON
American Radiator Co., New York.

PIPE HANGERS
Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Walworth Co., New York.

PIPE THREADING & CUTTING MACHINES
Crane Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.

PIPE, STEEL
Crane Co., Chicago, Ill.
National Tube Co., Pittsburgh, Pa.

PRESSURE REDUCING VALVES
(See Regulators, Pressure).

PULLEYS, VARIABLE SPEED

PUMPS, ACID RESISTING
Duriron Co., Inc., The, Dayton, O.

PUMPS, CENTRIFUGAL
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Foster Wheeler Corp., New York.
Nash Engineering Co., So. Norwalk, Conn.
Trane Co., The, LaCrosse, Wis.

PUMPS, CENTRIFUGAL, VACUUM HEATING
Ames Pump Co., New York.
Chicago Pump Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.

PUMPS, CONDENSATION
American Steam Pump Co., Battle Creek, Mich.
Ames Pump Co., New York.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Connor Co., Inc., The W. B., New York.
Dunham Co., C. A., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

PUMPS, OIL
Janette Mfg. Co., Chicago, Ill.
Nugent & Co., W. W., Chicago, Ill.

PUMPS, RECIPROCATING STEAM
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.

PUMPS, SUMP
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.

PUMPS, TURBINE
Ames Pump Co., New York.
Foster Wheeler Corp., New York.
Nash Engineering Co., So. Norwalk, Conn.

PUMPS, VACUUM
American Steam Pump Co., Battle Creek, Mich.
Ames Pump Co., New York.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Foster Wheeler Corp., New York.
Janette Mfg. Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.

RADIATION, LIGHT WEIGHT, NON FERROUS
American Radiator Co., New York.
McQuay Radiator Co., Chicago, Ill.
The Herman Nelson Corp., Moline, Ill.
Rome Brass Radiator Corp., New York.
Thermal Units Co., Chicago, Ill.
Trane Co., The, La Crosse, Wis.
Young Radiator Co., Racine, Wis.

RADIATOR ENCLOSURES AND SHIELDS
American Metal Products Corporation, St. Louis, Mo.
Schleicher Inc., Gary, Ind.

RADIATOR HANGERS
American Radiator Co., Buffalo, N. Y.
Grinnell Co., Providence, R. I.
Hartmann Co., Charles, Brooklyn, N. Y.
Healy-Ruff Co., St. Paul, Minn.
Kewanee Boiler Corp., Kewanee, Ill.
McAlear Mfg. Co., Chicago, Ill.
Pierce, Butler & Pierce Mfg. Co., New York.

RADIATORS, CABINET AND CONCEALED
Air-Way Electric Appliance Corp., Toledo, Ohio.
McQuay Radiator Corp., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
Nelson Corp., Herman, The, Moline, Ill.
Reed Air Filter Co., Inc., Louisville, Ky.
Richmond Radiator Co., New York.
Rome Brass Radiator Corp., New York.
Thermal Units Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Young Radiator Co., Racine, Wis.

RADIATORS, CAST-IRON
American Radiator Co., Buffalo, N. Y.
Burnham Boiler Corp., Irvington, N. Y.
Crane Co., Chicago, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Modine Mfg. Co., Racine, Wis.
National Radiator Corp., Johnstown, Pa.
Nelson Corp., Herman, The, Moline, Ill.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Co., New York.
U. S. Radiator Corp., Detroit, Mich.

RADIATORS, GAS FIRED
Automatic Gas Steam Radiator, Pittsburgh, Pa.

RECEIVERS, AIR
Brownell Co., The, Dayton, Ohio.
Frost Mfg. Co., Galesburg, Ill.
National Pipe Bending Co., New Haven, Conn.
Vapor Engineering Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

RECEIVERS, CONDENSATION
American District Steam Co., North Tonawanda, N. Y.
American Steam Pump Co., Battle Creek, Mich.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

REFRIGERATING APPARATUS
Vilter Mfg. Co., Milwaukee, Wis.

REGULATORS, BOILER-FEED
Atlas Valve Co., Newark, N. J.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.
Watts Regulator Co., Lawrence, Mass.

REGULATORS, DAMPER
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Atlas Valve Co., Newark, N. J.
Dunham Co., C. A., Chicago, Ill.
Gorton Heating Corp., New York.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicgao, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Sheer Co., H. M., Quincy, Ill.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Temperature Control Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Watts Regulator Co., Lawrence, Mass.
White Mfg. Co., St. Paul, Minn.
Wing Mfg. Co., L. J., New York.

REGULATORS, PRESSURE
American District Steam Co., North Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johnson Service Co., Milwaukee, Wis.
Kainer & Company, Chicago, Ill.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mueller Co., Decatur, Ill.
National Regulator Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Watts Regulator Co., Lawrence, Mass.

REGULATORS, TEMPERATURE
(See Temperature Control)

SEPARATORS, OIL
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Webster & Co., Warren, Camden, N. J.

SEPARATORS, STEAM
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Swartwout Co., Cleveland, Ohio.
Webster & Co., Warren, Camden, N. J.

SPRAY COOLING SYSTEMS
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
General Air Filters Corp., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

SPRAY NOZZLES
(See Nozzles, Spray)

STERILIZER, WATER
U. S. Ozone Corp., Scottdale, Penn.

STOKERS, MECHANICAL
Brownell Co., Dayton, Ohio.
Domestic Stoker Co., New York.
Fire-King Stoker Co., Indianapolis, Ind
General Stoker Corp., New York.

STRAINERS, OIL
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Nugent & Co., W. W., Chicago, Ill.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.

STRAINERS, STEAM
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.

STRAINERS, WATER
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Watts Regulator Co., Lawrence, Mass.

TEMPERATURE CONTROL
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Carrier Engineering Corp., Newark, N. J.
Foxboro Co., Inc., The, Foxboro, Mass.
Fulton Sylphon Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Penn Electric Switch Co., Des Moines, Raymond, F. I., Chicago, Ill.
Sarco Co., Inc., New York.
Sheer Co., H. M., Quincy, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Temperature Control Co., Chicago, Ill.
Time-O-Stat Controls Co., Elkhart, Ind.
Trane Co., The, LaCrosse, Wis.
Watts Regulator Co., Lawrence, Mass.
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Bristol Co., The Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Powers Regulator Co., Chicago, Ill.

THERMOSTATS

American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Sheer Co., H. M., Quincy, Ill.
Temperature Control Co., Chicago, Ill.
Time-O-Stat Controls Co., Elkhart, Ind.
White Mfg. Co., St. Paul, Minn.

TRAPS, BUCKET

Crane Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Swartwout Co., Cleveland, Ohio.
Trerice Co., H. O., Detroit, Mich.

TRAPS, FLOAT

Crane Co., Chicago, Ill.
General Air Filters Corp., New York.
Marsh & Co., Jas. P., Chicago, Ill.
Sarco Co., Inc., New York.
Swartwout Co., Cleveland, Ohio.

TRAPS, FLOAT & THERMOSTATIC

Dunham Co., C. A., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.

TRAPS, INVERTED BUCKET (STEAM AND AIR)

Armstrong Machine Wks., Three Rivers, Mich.

TRAPS, LIFTING

Crane Co., Chicago, Ill.
Lytton Mfg. Corp., Franklin, Va.
Swartwout Co., Cleveland, Ohio.

TRAPS, RADIATOR

American District Steam Co., North Tonawanda, N. Y.
Armstrong Machine Wks., Three Rivers, Mich.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

TRAPS, RETURN

American Blower Co., Detroit, Mich.
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Swartwout Co., Cleveland, Ohio.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

TRAPS, STEAM

American Blower Co., Detroit, Mich.
American District Steam Co., North Tonawanda, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Connor Co., Inc., The W. B., New York.
Crane Co., Chicago, Ill.
Davis Engineering Corp., New York.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
General Air Filters Corp., New York.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Trerice Co., H. O., Detroit, Mich.

TRAPS, VACUUM

American Blower Co., Detroit, Mich.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Swartwout Co., Cleveland, Ohio.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

TUBING, COPPER AND BRASS

Crane Co., Chicago, Ill.
Wolverine Tube Co., Detroit, Mich.

TURBINES, STEAM

Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

TURBO-BLOWERS

Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

UNIT HEATERS

(See Heaters, Unit)

VACUUM CLEANING APPARATUS

American Radiator Co., Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

VALVES, ACID RESISTING

Crane Co., Chicago, Ill.
Duriron Co., Inc., The, Dayton, O.

VALVES, AIR, AUTOMATIC

American Radiator Co., Buffalo, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Chadeayne, Geo. D.,
Crane Co., Chicago, Ill.
Dole Valve Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Hoffman Specialty Co., New York.
Jenkins Bros., New York.
Kelly Brass Works, Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
National Regulator Co., Chicago, Ill.
Page Boiler Co., Wm., H., New York.
Powers Regulator Co., Chicago, Ill.

VALVES, AIR RELIEF

American Radiator Co., Buffalo, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Gorton Heating Corp., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Sarco Co., Inc., New York.
Trane Co., The, LaCrosse, Wis.

VALVES, BACK PRESSURE

Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York.

VALVES, BALANCED

Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Watts Regulator Co., Lawrence, Mass.

VALVES, BLOW-OFF

Crane Co., Chicago, Ill.
Jenkins Bros., New York.
Lytton Mfg. Corp., Franklin, Va.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York.

VALVES, CHECK

Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York.

VALVES, FLOAT

Atlas Valve Co., Newark, N. J.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Schutte & Koerting Co., Philadelphia, Pa.
Time-O-Stat Controls Co., Elkhart, Ind.
Watts Regulator Co., Lawrence, Mass.

VALVES, GATE

American District Steam Co., North Tonawanda, N. Y.
Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh Valve Co., Dunkirk, N. Y.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York.

VALVES, GLOBE, ANGLE & CROSS

Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh Valve Co., Dunkirk, N. Y.
National Radiator Corp., Johnstown, Pa.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York.

VALVES, HYDRAULIC-OPERATING

Crane Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Walworth Co., New York.

VALVES, MAGNETIC

Time-O-Stat Controls Co., Elkhart, Ind.

VALVES, NON-RETURN

Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York.

VALVES, RADIATOR

American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Gorton Heating Corp., New York.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh & Co., Jas. P., Chicago, Ill.
Marsh Valve Co., Dunkirk, N. Y.
National Radiator Corp., Johnstown, Pa.
National Regulator Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Walworth Co., New York.
Webster & Co., Warren, Camden, N. J.

VALVES, PRESSURE REDUCING

(See Regulators, Pressure)

VALVES, REGULATING

Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kainer & Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Walworth Co., New York.

VALVES, VACUUM RELIEF

Watts Regulator Co., Lawrence, Mass.

VALVES, RELIEF (WATER)

American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Kainer & Co., Chicago, Ill.
Kennedy Valve Mfg. Co., Elmira, N. Y.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mueller Co., Decatur, Ill.
National Radiator Corp., Johnstown, Pa.

VALVES, SAFETY

American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Crane Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh & Co., Jas. P., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Time-O-Stat Controls Co., Elkhart, Ind.
Walworth Co., New York.

VALVES, STOP AND CHECK

(See Valves, Non-Return).

VENTILATING SYSTEMS

American Blower Co., Detroit, Mich.
American Radiator Co., Buffalo, N. Y.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
General Air Filters Corp., New York.
National Regulator Co., Chicago, Ill.
Nelson Corp., Herman, The, Moline, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

VENTILATING SYSTEMS, ACID

Duriron Co., Inc., The, Dayton, O.

VENTILATORS

Bayley Blower Co., Milwaukee, Wis.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

VENTILATORS, FLOOR

Aeolus Dickinson, Chicago, Ill.
American Blower Co., Detroit, Mich.
American Metal Products Corporation, St. Louis, Mo.
Buffalo Forge Co., Buffalo, N. Y.
Knowles Mushroom Ventilator Co., New York.
Ventilating Products Co., Chicago, Ill.

VENTILATORS, ROOF

Aeolus Dickinson, Chicago, Ill.

VENTILATORS, UNIT

American Blower Co., Detroit, Mich.
Nelson Corp., Herman, The, Moline, Ill.
Peerless Unit Ventilation Co., Inc., Bridgeport, Conn.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

WATER STERILIZERS

Clow Co., Jas. B., Chicago, Ill.

WEATHER STRIPS, METAL

Athey Co., Chicago, Ill.

WRENCHES, STILLSON

Walworth Co., New York.

ZONE HEATING SYSTEMS

Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Webster Talmadge, New York.

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will furnish delightful warmth for the tenants of this palatial new 24-story Chicago residence apartment building...

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Architects: Robert S. De Golyer & Co., Chicago
Consulting Engineer: H. L. Clute, Chicago
Heating Contractor: Kinzie Engineering Co., Chicago

No. 1430 Lake Shore Drive is an outstanding building projecting some 270 feet skyward amid a setting of famous skyscraper apartment buildings, with a permanently unobstructed and commanding view of Lake Michigan. It contains twelve twelve-room apartments, including six baths, and eleven eleven-room apartments, including five baths. Its architecture is modified Tudor Gothic. The first floor plan includes a twenty car garage for use of tenants, with chauffeurs room adjoining.

The apartments, each of which occupies an entire floor, give the privacy of a detached residence and offer the most lavish and complete of accommodations, with every modern convenience and improvement for the comfort and welfare of tenants.

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Over eighty sales offices in the United States, Canada and the United Kingdom bring Dunham Heating Service as close to you as your telephone. Consult your telephone directory for the address of our office in your city. An engineer will counsel with you on any project.

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DUNHAM BUILDING
450 East Ohio Street : CHICAGO

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The Dunham Differential Vacuum Heating System and individual parts of the apparatus used in that system are fully protected by United States Patents Nos. 1,644,114 and 1,708,401, and Canadian Patents Nos. 282,193, 282,194 and 282,195. Additional patents in the United States, Canada and foreign countries are now pending.

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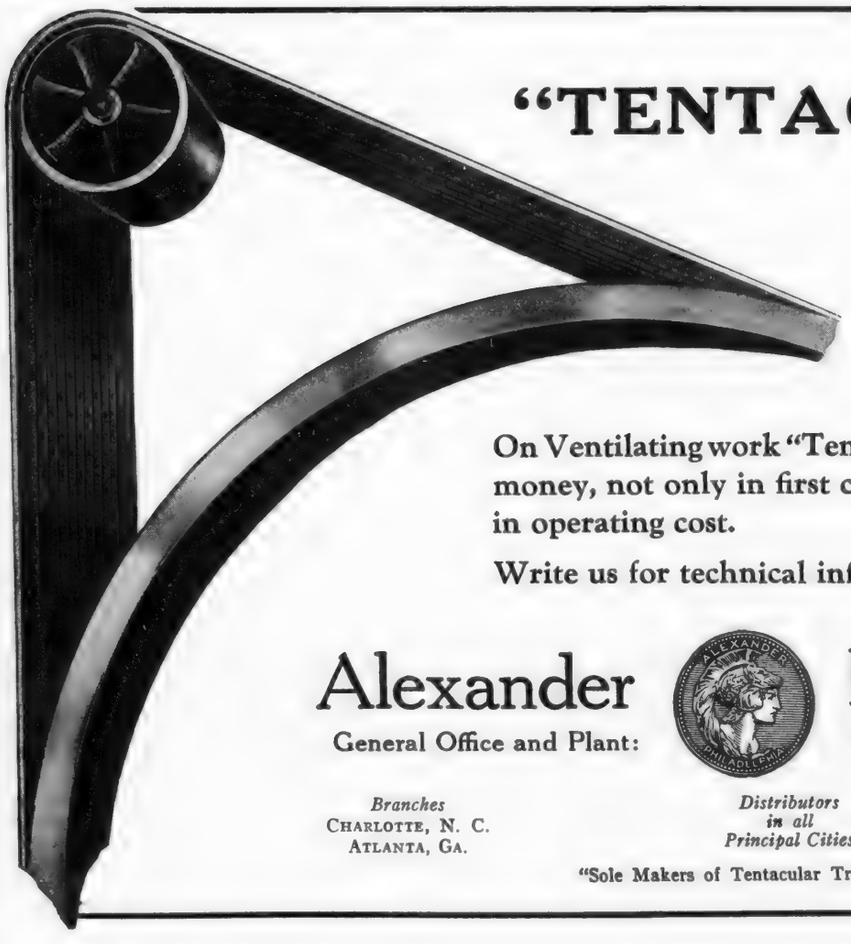

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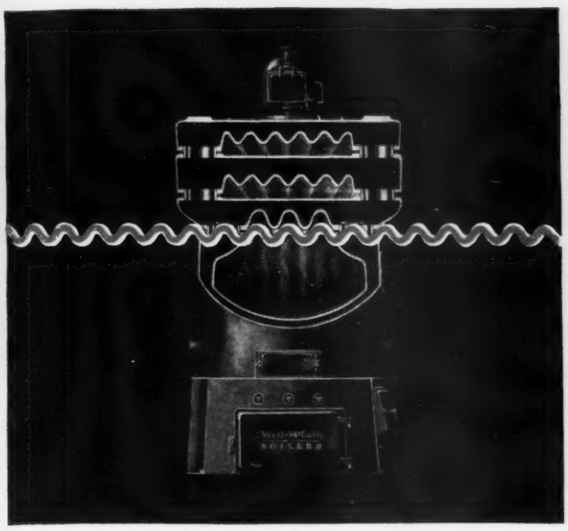
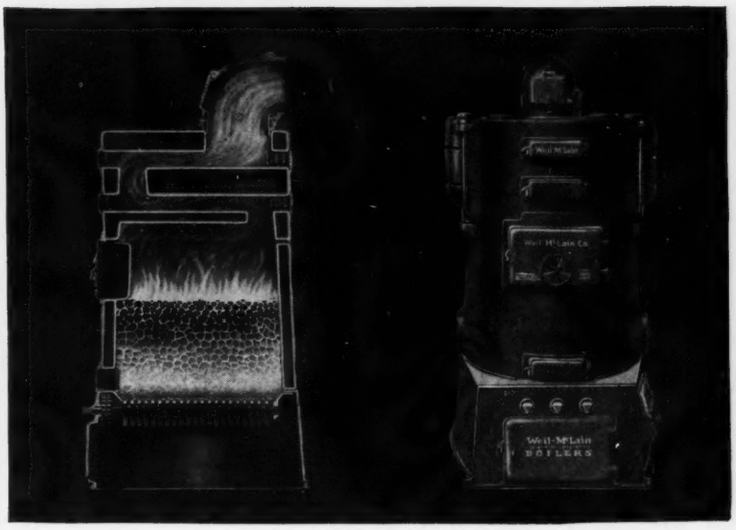
These corrugations *reduce fuel bills*





They crowd 30% to 40% more vital heating surface into the same size of boiler

Suppose you study for a moment the wavy line shown above. Just a casual comparison of a wavy line like this ~~~~, with a straight line like this _____, tells you that the wavy line will crowd perhaps one-third more lineal surface into a given space.

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By thus crowding 30% to 40% more heating surface into the same space, more fuel economy and greater heat-producing ability are crowded into this Weil-McLain Boiler. As a result, it heats a home with fewer tons of coal or coke, or fewer gallons of oil consumed.

You will also find other reasons for the fuel-saving ability of this Weil-McLain Boiler. For example, it has a long, balanced back-and-forth fire travel. The hot gases are baffled backward and forward through the corrugated heating surfaces. There are no short cuts to the chimney, under *any* condition. A final safeguard against waste!

There are Weil-McLain Boilers to meet all conditions . . . Round Type, Jacketed, Self-feed, Square, and Smokeless. Also Weil-McLain Radiators.

They look alike,
but *are* they?
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SCIENTIFIC COMBUSTION
BOILERS

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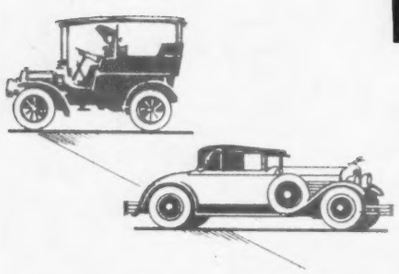
There's Money ..in this

MODERNIZING BUSINESS



It's in the air. People want *modern* things. They turn in their cars every year or two, for new, more modern cars. They do the same with their radio sets. They replace out-of-style clothes with new stylish apparel. Things a little bit out of date are banished nowadays.

Here's the point. There are a great many folks in your locality who ought to modernize their steam heating systems by replacing air vent valves with Hoffman No. 2 Vacuum Valves. By doing this they have a thoroughly modern system—virtually a vacuum system.

Ordinary vent valves are out of date. These people around you are exactly in the mood to act on this wise suggestion. Many heating contractors have proved it already, and have made money proving it. They have followed up the big Plumbing & Heating Industries Bureau "modernizing" campaign and the Hoffman No. 2 Vacuum Valve advertising, by *going after business.*

Their men carry Hoffman No. 2 Valves in their pockets. At every opportunity they talk to prospects and customers about modernizing and vacuum-izing their heating systems. If you haven't tried this you don't know how easy it is to get a whale of a lot of extra business.

Now is the time to start. Remind folks that cold weather is almost here. Talk Hoffman No. 2 Vacuum Valves. Tell them what it means in quick, extra heat and fuel saving.

If you'd like advice on how to start a Modernizing-Vacuum-izing campaign in your town, write Hoffman Specialty Company, Inc., Dept. C-55, Waterbury, Connecticut.

HOFFMAN No. 2 VACUUM VALVES

The combination of a vacuum disc and a vacuum diaphragm is found only in Hoffman No. 2 Vacuum Valves. This *double lock* assures proper functioning for *many years.*